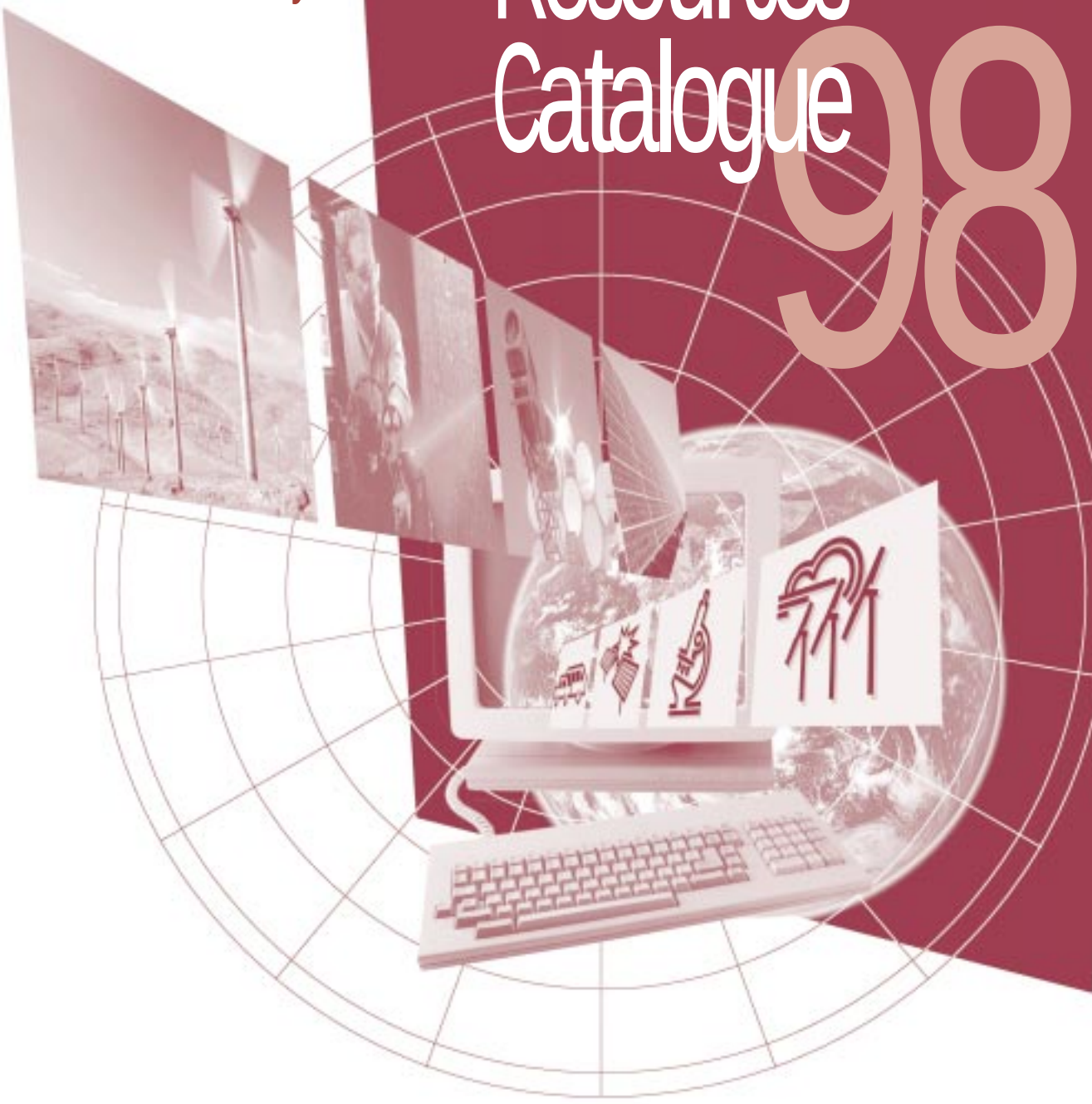
National Renewable Energy Laboratory

Information Resources Catalogue 98



About the Catalogue

Our fifth annual *Information Resources Catalogue* describes recent National Renewable Energy Laboratory (NREL) publications that can keep you up to date on energy efficiency and renewable energy. To make the catalogue easy to use, we have grouped entries according to subject area.

The catalogue is separated into five main sections. The first section lists Web sites designed and/or maintained by NREL. The General Interest Publications—accompanied by concise descriptions that highlight the latest advances in energy efficiency and renewable energy technologies—make up the second section of the catalogue. The third section lists Technical Reports, which update the research community on the latest innovations from NREL's labs. Conference Papers, Journal Articles, and Book Chapters can be found in the fourth section. Patents is the fifth and final section of the catalogue.

The publications listed in the catalogue, as well as bibliographic information on documents published in previous years, may be accessed on-line via the NREL Home Page at http://www.nrel.gov. Our Web sites—including exciting new offerings such as the National Center for Photovoltaics and Energy Savers—are being continually updated and improved. Be sure to visit our various sites for the latest information on technical breakthroughs in renewable energy and energy efficiency technologies.

Our project team has enjoyed putting together this fifth issue of the catalogue. We hope you find it helpful and informative.

About the National Renewable Energy Laboratory

NREL is the U.S. Department of Energy's premier laboratory for renewable energy and energy efficiency research, development, and deployment. The Laboratory is a national resource committed to leadership, excellence, and innovation in renewable energy and related technologies.

NREL conducts research in photovoltaics, wind energy, advanced vehicle technologies, biofuels, biomass electric, municipal solid waste, hydrogen, geothermal power, and superconductivity. Advances made in these research areas enable the private sector to make informed choices from a number of energy options.

Key to NREL's mission is facilitating the transfer of these technologies to private industry for commercialization. We do this by cooperating with industry through cost-shared agreements, collaborating with universities and other researchers, and making facilities available for experiments, analyses, and proprietary studies.

NREL is managed for DOE by Midwest Research Institute, Battelle, and Bechtel.

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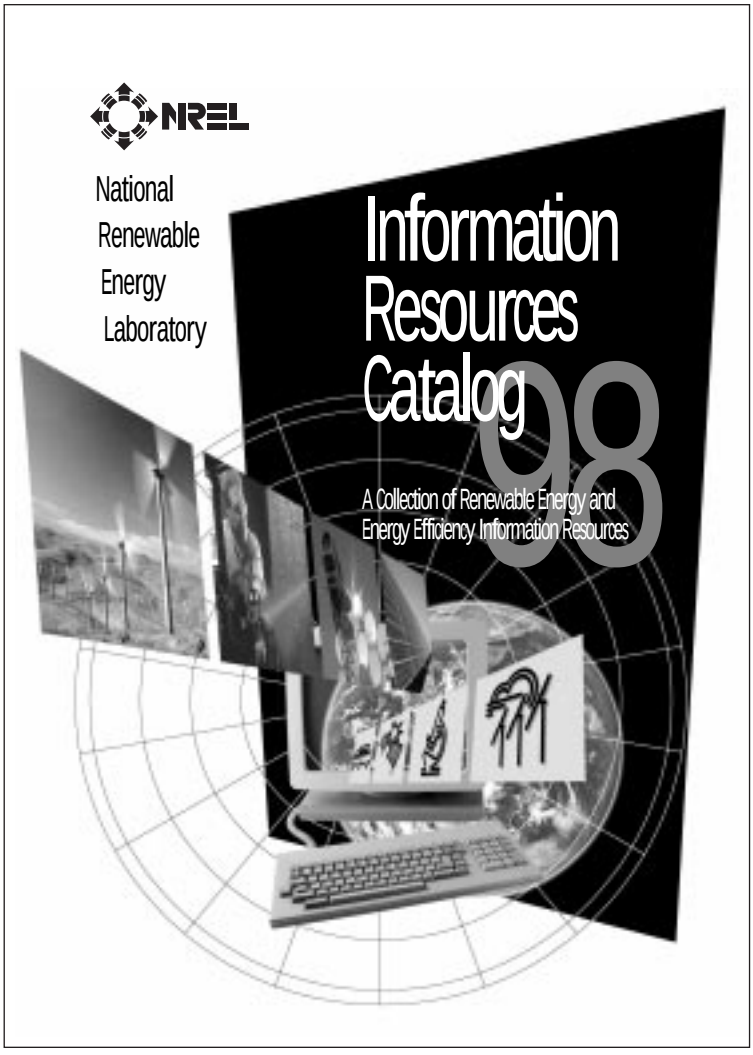
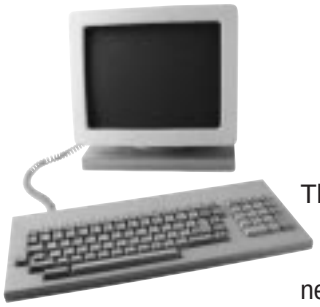


Internet Resources



The sites listed below provide information on many energy efficiency and renewable energy technologies. New Internet sites are created regularly, so be sure to visit these home pages often for new and updated information.

National Renewable Energy Laboratory (http://www.nrel.gov)

Since its inception in 1977, NREL's mission has been to develop energy efficiency and renewable energy technologies and transfer these technologies to the private sector. The Web site provides information about NREL's technologies, online resources, and programs.

Research and Technology—NREL's research activities and expertise help reduce the cost and increase the use of renewable energy and energy efficiency technologies.

- Basic Sciences and Materials—http://www.nrel.gov/st-bsm.html
- Buildings and Thermal Systems—http://www.nrel.gov/st-bt.html
- Electricity Technologies—http://www.nrel.gov/st-et.html
- Fuels and Chemicals—http://www.nrel.gov/st-fc.html
- Industrial Technologies—http://www.nrel.gov/st-it.html
- Measurements and Testing—http://www.nrel.gov/st-mt.html
- Photovoltaics—http://www.nrel.gov/ncpv/
- Renewable Energy Resources—http://www.nrel.gov/energy_resources/
- Transportation—http://www.nrel.gov/st-trans.html
- Wind Energy—http://www.nrel.gov/wind/

Online Resources—NREL's databases provide documents and digital photographs of renewable energy and energy efficiency technologies.

- NREL Publications—http://www.nrel.gov/cgi-bin/pubspage.cgi
- PIX—Online Photographic Library—http://www.nrel.gov/data/pix/pix.html

Partnerships—NREL creates and coordinates partnerships for market and technology development. NREL programs also help teachers instruct tomorrow's workforce about science, math, and clean energy solutions.

- International Programs—http://www.nrel.gov/business/international/intl_graphics.html
- Technology Transfer—http://www.nrel.gov/technologytransfer
- Education Programs—http://www.nrel.gov/business/education.html

Energy Efficiency and Renewable Energy Network (EREN) http://www.eren.doe.gov/

EREN is the official Web site for the U.S. Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy. EREN contains documents from DOE programs and maintains links to other government, education, industry association, and international organization Web sites. EREN offers a robust search capability and resources for specific audiences.

Technologies

Alternative Fuels—http://www.eren.doe.gov/RE/fuels.html

Buildings—http://www.eren.doe.gov/EE/buildings.html

Geothermal—http://www.eren.doe.gov/RE/geothermal.html

Hydropower—http://www.eren.doe.gov/RE/hydropower.html

Industry—http://www.eren.doe.gov/EE/industrial.html

Ocean—http://www.eren.doe.gov/RE/ocean.html

Solar—http://www.eren.doe.gov/RE/solar.html

Transportation—http://www.eren.doe.gov/EE/transportation.html

Utilities—http://www.eren.doe.gov/EE/utilities.html

Wind—http://www.eren.doe.gov/RE/wind.html

Specialized Resources

Consumers—http://www.eren.doe.gov/consumerinfo/

Education—http://www.eren.doe.gov/education/

Environment—http://www.eren.doe.gov/environment/

Kids—http://www.eren.doe.gov/kids.html

News—http://www.eren.doe.gov/events/

Small Business—http://www.eren.doe.gov/energytips/

Related Information

DOE Headquarters—http://www.doe.gov/

DOE Office of Energy Efficiency and Renewable Energy—http://www.eren.doe.gov/ee.html

DOE Regional Support Offices—http://www.eren.doe.gov/rso.html

DOE Golden Field Office—http://www.eren.doe.gov/golden/

DOE OSTI*—Energy Science and Technology Database—
http://www.doe.gov/html/eren/eren.html

*Office of Scientific and Technical Information

General Interest Publications

The following publications are grouped according to subject matter for your convenience. The information contained in these documents is generally nontechnical in nature and is intended for a wide audience. Unless otherwise noted, NREL general interest publications are available in limited quantities from NREL's Document Distribution Service at (303) 275-4363 (phone), (303) 275-4053 (fax), or Sally_Evans@nrel.gov (e-mail).

Alternative Fuels

Bioethanol from the Corn Industry: From Corn to Cellulose—Building a Bridge to Bioethanol Production (Fact sheet). May 1998; 2 pp. With our increased dependence on foreign sources of oil for transportation and legislation that requires both compliance with environmental standards and the use of oxygenated fuels, the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) is seeking ways to economically increase the yield of ethanol from biomass such as corn fiber. Read this fact sheet to learn how NREL's researchers are working to meet this goal. Order no. DOE/GO-10097-577.

Biofuels: 1996-1997 Project Summaries (Online document). February 1998; 151 pp. Biofuels such as ethanol and biodiesel—liquid and gaseous fuels made from renewable domestic crops—may provide the solution to the nation's overdependence on petroleum-based energy sources. Each summary sheet in this volume provides information on the project funding, objectives, approach, accomplishments, status, and publications of the DOE-funded biofuels projects for 1996-97. Also available online at: *http://www.esd.ornl.gov/bfdp/doeofd/96_97summaries/bioprogram.html* Order no. DOE/GO-10098-521.

Biofuels News—Summer 1998 (Newsletter). September 1998; 1(3): 6 pp. There is overwhelming evidence to indicate that U.S. farmers could use a great deal of land for energy crops, without using land that supports natural ecosystems and endangered wildlife. This edition of the DOE Office of Transportation Technologies newsletter focuses on our need to make responsible decisions regarding some of the fundamental energy issues facing our nation today: Which energy solutions best meet our needs given environmental and economic realities? What are our real needs? What kinds of technologies can we use?
Order no. DOE/GO-10098-581.

Biofuels News—Spring 1998 (Newsletter). May 1998; 1(2): 6 pp. Articles focus on corn stover, which is a rich source of potential energy once its cellulose is converted to ethanol; efforts on the federal legislative front to rescue a provision for an ethanol tax incentive; and several new publications on biofuels, including the National Renewable Energy Laboratory's *The Ethanol Heavy-Duty Truck Fleet Demonstration Project.* Order no. DOE/GO-10098-571.

Biofuels News—Winter 1998 (Newsletter). January 1998; 1(1): 4 pp. This is the debut of another innovative NREL publication, whose mission is to advance the development and commercialization of alternative fuels, this time on behalf of DOE's Office of Fuels Development (a division of the Office of Transportation Technologies). NREL is one of two federal laboratories (Oak Ridge National Laboratory is the other) whose R&D successes have helped to promote ethanol as a cost-competitive alternative to gasoline. Ethanol use is also seen as part of an effective solution to the greenhouse gas problem. Available online at: *http://afdc3vh5.nrel.gov/biofuelnews/winter98_1-1/* or *http://afdc3vh5.nrel.gov/biofuelnews/winter98_1-1/vol1iss1.pdf* Order no. DOE/GO-10098-529.

Biofuels Update: Report on U.S. Department of Energy Biofuels Technology—Fall 1997 (Newsletter). November 1997; 5(4): 4 pp. Highlights of this edition include stories on California's potential for providing feedstocks for ethanol production, the Senate Finance Committee's extension of ethanol tax incentives in its reauthorization of new highway legislation, and the big impact U.S. farmers may have in reducing carbon emissions by using low-input farming techniques and by growing switchgrass or woody biomass that can be used to produce ethanol and other biofuels. Order no. BR-580-23449.

Biomass Power

Biopower Project Updates (Fact sheets). September 1998; 2 pp. These fact sheets, produced by DOE's Biomass Power Program, show the progress of the program's demonstration projects. One of these demonstrations is a low-pressure biomass gasifier located in Burlington, Vermont. The other projects are part of DOE's Biomass Power for Rural Development Initiative that is cosponsored by the U.S. Department of Agriculture. The rural development projects involve developing energy crops for power systems: one in New York

cofiring willow with coal in utility power plants, one in Iowa cofiring switchgrass with coal, and one in Minnesota using alfalfa stems as fuel for an integrated gasifier combined-cycle gas turbine facility.

Gasifier Kindles Biopower Potential
Order no. DOE/GO-10098-659.

Project Update: Chariton Valley
Order no. DOE/GO-10098-661.

Project Update: Minnesota AgriPower
Order no. DOE/GO-10098-663.

Project Update: Salix Consortium
Order no. DOE/GO-10098-664.

Project Update: Vermont Gasifier
Order no. DOE/GO-10098-662.

Buildings

Building America Program Overview (Online fact sheet). April 1998; 2 pp. Building America is accelerating home-building innovations using systems-engineering approaches that increase the quality and energy efficiency of homes while reducing cost and environmental impacts. By reading this fact sheet, you can find summary program information, learn about the overall objectives of the program, meet the Industry Consortia, and see the locations of our building sites. Available online at: *http://www.eren.doe.gov/buildings/building_america/over.html*

Buildings for the 21st Century (Online document). October 1997; 7 pp. In order to speed the adoption of new technologies and design know-how, Buildings for the 21st Century, part of DOE's Office of Building Technologies, State and Community Programs, is taking a nontraditional, whole-building, systems integration approach. This booklet provides information about Building America and Exemplary Buildings, two programs that use this energy-saving collaborative strategy. Available online only at: *http://www.nrel.gov/buildings/exemplary/b21c.pdf*

Commercial Heat Pump Water Heaters. Federal Energy Management Program (FEMP): Federal Technology Alert (Online document). February 1997. This Alert provides information on heat pump water heater (HPWH) technologies: where they have been installed, how they work, and who is producing them, as well as information to help a facility manager evaluate applications where HPWHs could be cost effectively installed. Available online only at: *http://www.eren.doe.gov/femp/10_comm.html*

Energy Efficiency Solution for the Chet Holifield Federal Building. Federal Energy Management Program (FEMP): Utility Services Case Study (Fact sheet). April 1998; 2 pp. In November 1993, the General Services Administration (GSA) and Southern California Edison (SCE) agreed to review the potential benefits of an integrated energy efficiency solution for the Chet Holifield Federal Building in Laguna Niguel, California. As a result of the recommendations that were implemented from the GSA-SCE feasibility study, estimated annual energy savings amounted to $640,000 (even greater than initially projected).
Order no. DOE/GO-10098-437.

Energy Savers: Tips on Saving Energy and Money at Home (Booklet). September 1997; 36 pp. The U.S. Department of Energy works to ensure secure, reliable, and affordable energy supplies that support a growing economy and protect the environment and public health. The energy efficiency improvements and tips in this booklet are easy ways that you can do your part for the nation's energy security—while saving on your energy bills. To obtain copies, please contact the Energy Efficiency and Renewable Energy Clearinghouse (EREC) at 1-800-DOE-EREC (1-800-363-3732). Also available online at: *http://www.eren.doe.gov/consumerinfo/energy_savers/* or *http://www.eren.doe.gov/consumerinfo/energy_savers/web-EnergySavers.qxd.pdf*
Order no. DOE/GO-10097-431.

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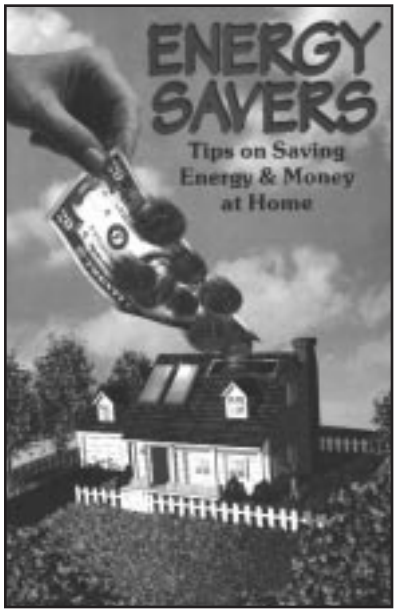


Federal Participation in Million Solar Roofs. What's New in Federal Energy Management: Program Overview (Fact sheet). March 1998; 2 pp. The President's commitment to place 20,000 solar energy systems on federal buildings by the year 2010 will require the development of a sustainable federal market for cost-effective solar technologies. As this fact sheet explains, DOE's Federal Energy Management Program is focusing on technologies that include solar hot water for buildings and swimming pools, and solar space heating.
Order no. DOE/GO-10098-516.

FEMP Training Program. What's New in Federal Energy Management: Program Overview (Fact sheet). November 1997; 2 pp. The U.S. Department of Energy's Federal Energy Management Program (FEMP) has developed a training program to qualify federal energy managers (both technical and procurement specialists) in each of the following areas: basics of building energy systems; building energy codes and applicable professional standards; energy accounting and analysis; life-cycle cost methodology; fuel supply and pricing; and instrumentation for energy surveys and audits. The fact sheet describes course offerings—which are being revised and improved each fiscal year—in these and other areas. Also available online at: *http://www.eren.doe.gov/femp/resources/train_overview.html*
Order no. DOE/GO-10097-442.

Innovative Utility Partnership at Fort Lewis, Washington. Federal Energy Management Program (FEMP): Utility Services Case Study (Fact sheet). December 1997; 2 pp. In addition to lighting and motor retrofits that will save the 4200-building facility more than 27 million kilowatt-hours (about $700,000) per year, the arrangement between the utility and Fort Lewis will improve administrative efficiencies and reduce administrative costs. Read this fact sheet and find out how. Also available online at: *http://www.eren.doe.gov/femp/financing/97.440.html*
Order no. DOE/GO-10097-440.

Parabolic-Trough Solar Water Heating. Federal Energy Management Program (FEMP): Federal Technology Alert (Report). April 1998; 44 pp. This Alert, part of a series on new energy efficiency and renewable energy technologies, describes the technology of parabolic-trough solar water heating and absorption-cooling systems, the situations in which they are likely to be cost effective, and considerations in designing and selecting a system.
Order no. DOE/GO-10098-485.

Photovoltaics in the Built Environment: A Design Guide for Architects and Engineers (Handbook). September 1997; 264 pp. This handbook provides an overview of the issues that architects and engineers must consider when designing PV systems for buildings. These issues include how to size the system, system components, integrating the system with the building envelope and systems, codes and standards, utility rate structures and incentives, and others.
Order no. DOE/GO-10097-436.

Renewable Energy at Channel Islands National Park. Federal Energy Management Program: Technical Assistance Case Study (Fact sheet). November 1997; 2 pp. In September 1995, a grant from DOE's FEMP allowed the National Park Service to implement a hybrid wind/photovoltaic energy project that will help to protect the Channel Islands' pristine resources. This case study describes the energy systems installed on Santa Rosa, San Miguel, Anacapa, and Santa Barbara Islands, and the environmental and economic benefits that will accrue. Also available online at: *http://www.eren.doe.gov/femp/techassist/275.html*
Order no. DOE/GO-10097-275.

Saving Energy with Electric Resistance Heating. Energy Efficiency and Renewable Energy Clearinghouse (EREC) (Brochure). October 1997; 8 pp. Electricity is a versatile but precious energy source that we need to use wisely and conserve whenever possible. This publication provides an introduction to the different types of electric heating that you can use in your home today to help you save money and minimize your energy consumption. To obtain copies, please contact the Energy Efficiency and Renewable Energy Clearinghouse (EREC) at 1-800-DOE-EREC (1-800-363-3732). Also available online at: *http://www.eren.doe.gov/erec/factsheets/elecheat.html* or *http://www.eren.doe.gov/erec/factsheets/elecheat.pdf*
Order no. DOE/GO-10097-381.

Solar Buildings Overview: The Solar Buildings Program (Brochure). April 1998; 4 pp. As the brochure explains, solar buildings technologies offer several advantages when compared to competing sources of power. First, by developing solar technology, we diversify our energy supply and reduce our susceptibility to fluctuations in the availability and price of imported fossil fuels. Next, a mature solar manufacturing and service industry promotes job creation and local economic development. Third, recent surveys and consumer choice utility programs demonstrate customer preference for clean sources of energy. Finally, the brochure explains that each solar water heating system reduces carbon emissions by an amount equivalent to the emissions from an automobile.
Order no. DOE/GO-10098-552.

(see photo top of column 3)

Solar Water Heating. Federal Energy Management Program (FEMP): Federal Technology Alert (Revised booklet). April 1998; 44 pp. Solar water heating is a well-proven and readily available technology that directly substitutes renewable energy for conventional water heating. This FEMP Federal Technology Alert, one of a series on new energy-efficient and renewable energy technologies, describes the various types of solar water heating systems, the situations in which solar water heating is likely to be effective, considerations in designing and selecting a system, and basic steps for installation.
Order no. DOE/GO-10098-570.

Thermal Energy Storage at a Federal Facility. Federal Energy Management Program (FEMP): Utility Services Case Study (Fact sheet). May 1998; 2 pp. This FEMP fact sheet explains the unique partnership between the Veteran's Administration (VA) Medical Center in Dallas, Texas, and Texas Utilities Electric Company. The energy savings resulting from the installation of thermal storage technology will allow the VA to recoup its investment within seven years, as well as to balance the energy demands of the facility during peak periods.
Order no. DOE/GO-10098-439.

Total-Solutions Approach at White Sands Missile Range. Federal Energy Management Program: Utility Services Case Study (Fact sheet). December 1997; 2 pp. The White Sands Missile Range, located 40 miles north of El Paso, Texas, occupies an area about the size of Delaware and Rhode Island combined. This FEMP fact sheet describes how the state-of-the-art research and test facility (a missile proving grounds in the mid-1940s) will benefit from a FEMP project that will save the base more than $2 million per year in energy costs. Also available online at: *http://www.eren.doe.gov/femp/financing/97-441.html*
Order no. DOE/GO-10097-441.

Water Conservation Program. What's New in Federal Energy Management: Program Overview (Fact sheet). October 1997; 2 pp. Estimates indicate that federal-sector water and sewer expenditures are approaching $1 billion annually, and that the federal government could save as much as $240 million per year by installing water conservation measures. This fact sheet explains how FEMP is working with federal agencies to help achieve this goal.
Order no. DOE/GO-10097-421.

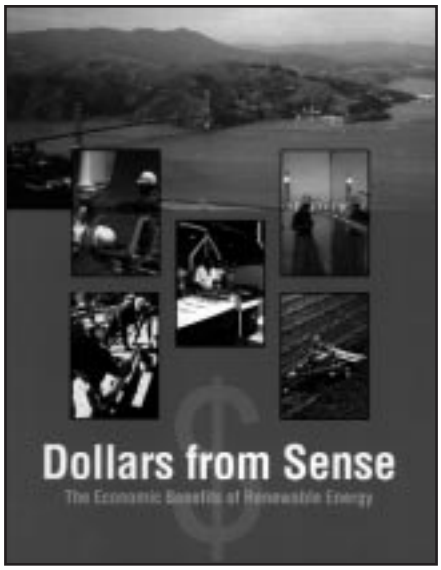
WhiteCap™ Roof Spray Cooling System. Federal Energy Management Program: Technology Installation Review (Online document). January 1998; 16 pp. This document reviews the theory, operation and development, and past installations of this highly effective technology, which has estimated potential annual savings of 585 million kilowatt-hours in the low-rise commercial-building market. Available online only at: *http://www.eren.doe.gov/femp/prodtech/whitecap.html*

Energy Efficiency and Renewable Energy

Value of Renewables...with a Short Guide to Renewable Energy Technologies (Report). October 1997; 44 pp. This comprehensive report examines some of the major issues that consumers should consider when making energy choices, including the environmental and health impacts, global climate change, energy security and subsidies, global markets and international competition, and jobs.
Order no. BK-330-23419.

Energy Policy and Analysis

Dollars from Sense: The Economic Benefits of Renewable Energy (Report). September 1997; 24 pp. Domestic renewable energy sources—biomass, wind power, photovoltaics, solar thermal electricity, and geothermal energy—represent a secure and stable source of energy for our nation and a potential source of jobs and economic development. This document illustrates the direct economic benefits of investing in these promising and vital energy technologies. Available online at: *http://www.eren.doe.gov/utilities/pdfs/dollars.pdf*
Order no. DOE/GO-10097-261.



Geothermal Energy

Geothermal Energy...Power from the Depths. Energy Efficiency and Renewable Energy Clearinghouse (Fact sheet). December 1997; 8 pp. U.S. geothermal power plants, including the steam plant at The Geysers in California, have a total generating capacity of 2700 megawatts, enough to provide electricity for 3.7 million people. This fact sheet explains the basics behind this power—what geothermal energy is and what forms it takes, how it can be tapped, and what economic and environmental benefits can accrue to you and your community by utilizing this exciting energy resource. To obtain copies of EREC fact sheets, please contact EREC at 1-800-DOE-EREC (1-800-363-3732). Also available online at: *http://www.eren.doe.gov/erec/factsheets/factsheets.html*
Order no. DOE/GO-10097-518.

Geothermal Technologies Today and Tomorrow (Folder). March 1998; 4 pp. Geothermal energy will be used to heat and cool more than 400,000 homes and commercial buildings by the turn of the century. Read the illustrated brochure (Order no. DOE/GO-10098-424) and following six fact sheets to find out how DOE's Office of Geothermal Technologies is leading the way in promoting research to improve geothermal heat pumps, exploration and drilling technology, reservoir engineering and energy conversion techniques, and direct use of geothermal energy.

Geothermal Technologies Today and Tomorrow: Direct Use of Geothermal Energy
Order no. DOE/GO-10098-536.

Geothermal Technologies Today and Tomorrow: Drilling
Order no. DOE/GO-10098-533.

Geothermal Technologies Today and Tomorrow: Energy Conversion
Order no. DOE/GO-10098-537.

Geothermal Technologies Today and Tomorrow: Exploration
Order no. DOE/GO-10098-534.

Geothermal Technologies Today and Tomorrow: Geothermal Heat Pumps
Order no. DOE/GO-10098-538.

Geothermal Technologies Today and Tomorrow: Reservoir Engineering
Order no. DOE/GO-10098-535.

Strategic Plan for the Geothermal Energy Program (Booklet). June 1998; 28 pp. DOE's Office of Geothermal Technologies has identified five strategic goals that will help establish geothermal energy as a sustainable, environmentally sound, economically competitive contributor to the nation's energy supply. This document relates how DOE, together with industry, plans to accomplish these goals.
Order no. DOE/GO-10098-572.

U.S. Department of Energy Geothermal Technologies—February 1998 (Newsletter). February 1998; 3(1); 8 pp. Geothermal heat pumps (GHPs) offer residential and commercial building owners a space-heating, cooling, and water-heating option that can reduce energy consumption by 25%-50% while significantly reducing energy costs. Read about GHPs and other exciting advances in the geothermal industry in this latest edition of the newsletter. Also available online at: *http://www.eren.doe.gov/geothermal/GRC/feb98_geotech.html*
Order no. BR-23958.


GEOTHERMAL TECHNOLOGIES

Hybrid Electric Vehicles

Battery Thermal Analysis and Testing: Providing Industry with World Class Solutions (Brochure). September 1998; 4 pp. As this brochure explains, NREL's state-of-the-art facilities and years of experience combine to offer companies integrated solutions to enhancing battery performance and extending the life of battery systems for electric and hybrid electric vehicles.
Order no. BR-540-24160.

Industry

Inventions and Innovations: Helping Bring Your Energy Ideas to Market (Brochure). July 1998; 6 pp. Do you have a plan to develop a company based on your energy-saving invention or innovation? Have you been searching for financial or technical support to bring your ideas to market? The U.S. Department of Energy's Inventions and Innovations Program can help.
Order no. DOE/GO-10098-596.

NICE^3: National Industrial Competitiveness through Energy, Environment, Economics (Brochure). March 1998; 2 pp. Wouldn't it be NICE if your company could gain financial support (awardees receive a one-time grant from DOE of as much as $400,000 for a proposed project) to participate in an innovative cost-sharing program designed to promote energy efficiency, prevent pollution, and encourage economic competitiveness in industry? Order this informative brochure to find out how your organization can sign on.
Order no. DOE/GO-10098-526.

Office of Industrial Technologies Fact Sheets. Innovative processes that save energy and reduce waste in the steel and aluminum industries are covered in this collection of fact sheets from the NICE^3 and Inventions and Innovations Programs through DOE's Office of Industrial Technologies. NICE^3 is a program that provides funding to state and industry partnerships for projects demonstrating energy-efficient, clean production technologies. The Inventions and Innovations Program provides financial assistance for establishing technical performance and conducting early development of inventions and ideas with significant energy savings impact potential.

Energy-Efficient Process for Hot-Dip Batch Galvanizing: NICE^3 Steel Project Fact Sheet. April 1998; 2 pp.
Order no. DOE/GO-10098-561.

Indirect-Fired, Controlled Atmosphere Decoating of Aluminum Scrap: NICE^3 Aluminum Project Fact Sheet. June 1998; 2 pp.
Order no. DOE/GO-10098-575.

Power Line Damage, Electrical Outages Reduced in the "Sleet Belt": Inventions and Innovations Steel Project Fact Sheet. April 1998; 2 pp.
Order no. DOE/GO-10098-559.

Processing Electric Arc Furnace Dust into Saleable Chemical Products: NICE^3 Steel Project Fact Sheet. April 1998; 2 pp.
Order no. DOE/GO-10098-560.

Steel Reheating for Further Processing: NICE^3 Steel Project Fact Sheet. April 1998; 2 pp.
Order no. DOE/GO-10098-548.

Office of Industrial Technologies Information Resources Catalog: Turning Industry Visions into Reality (Booklet). May 1998; 88 pp. This premier issue of the DOE Office of Industrial Technologies (OIT) catalog describes publications, videos, software, and other information products and services that your company can use to improve industrial energy efficiency and prevent waste and pollution.
Order no. DOE/GO-10098-423.

Plant/Crop-Based Renewable Resources 2020: A Vision to Enhance U.S. Economic Security Through Renewable Plant/Crop-Based Resource Use (Booklet). January 1998; 28 pp. This vision document—which resulted from a collaborative effort among U.S. companies, nonprofit groups, trade associations, and academic institutions—is a broad outline of the potential reaches of this homegrown feedstocks industry into the core manufacturing capabilities of this nation. The document starts off by defining plant/crop-based resources, then proceeds to examine the current status of these resources and evaluate future opportunities and priority areas for research and development through a process of matrix analysis.
Order no. DOE/GO-10098-385.

Regional Resource Centers for Innovation (Brochure). July 1998; 2 pp. This brochure provides details regarding these centers, which were established by the Inventions and Innovations Program in the Office of Industrial Technologies at DOE. The program works with inventors and innovators in the

Industries of the Future to fund research and development of energy-saving inventions and innovations.
Order no. DOE/GO-10098-574.

Turning Point—September 1998 (Motor Challenge Newsletter). September 1998; 8 pp. By optimizing the performance of just one of its steam turbines, Bethlehem Steel Corporation's Burns Harbor facility was able to save nearly $3.3 million a year and improve turbine efficiency and output. The technology used by Bethlehem could be applied to almost any industrial setting where steam turbines are used for shaft power, or to generate electricity on site. Read this and other articles to learn the many ways that your company can take the Motor Challenge.
Order no. DOE/GO-10098-585.

Turning Point—July 1998 (Motor Challenge Newsletter). July 1998; 8 pp. This issue's cover story provides details of Bethlehem Steel Corporation's successful Motor Challenge project, which reduced energy costs while improving overall steel-making system performance. Also featured are articles on the Steam Challenge, a voluntary partnership among DOE, the Alliance to Save Energy, and more than 50 industry leaders, which is designed to help industry adopt the systems approach in designing, purchasing, installing, and managing boilers, distribution systems, and steam applications; Motor Challenge's highly successful live satellite teleconference, which shared valuable information on improving motor system efficiency, process control, and productivity; and the Guest Column, which discusses the evolution of predictive maintenance for electric motors.
Order no. DOE/GO-10098-418.

Turning Point—May 1998 (Motor Challenge Newsletter). May 1998; 8 pp. By analyzing its system for batch cooling beer, Stroh's Brewing Company was able to improve energy efficiency and system performance. Read this spring issue to find out what else is brewing in DOE's Office of Industrial Technologies' Motor Challenge program.
Order no. DOE/GO-10098-417.

Turning Point—January 1998 (Motor Challenge Newsletter). January 1998; 8 pp. By making mechanical and electrical modifications to five of its oil wells under a Motor Challenge Showcase Demonstration project, OXY USA (a subsidiary of Occidental Petroleum Corporation) reduced energy consumption by more than 12% and achieved total annual savings of $5,362. Other stories in the newsletter focus on the Compressed Air Challenge, a national initiative to promote efficient and effective industrial compressed-air systems; a detailed discussion of what to believe—and what not to believe—about the efficiency numbers stamped on electric motor nameplates; and increasing international interest in establishing programs similar to Motor Challenge.
Order no. DOE/GO-10098-415.

Turning Point—November 1997 (Motor Challenge Newsletter). November 1997; 8 pp. This issue of the DOE Office of Industrial Technologies' quarterly newsletter has articles on the town of Turnbull, Connecticut, which used a Motor Challenge Showcase Demonstration project to drastically reduce the operational costs of its sewage-pumping system; the Technical Association of the Pulp and Paper Industry, which recently became a Motor Challenge Allied Partner; and various Allied Partner training, workshops, and other programs designed to educate utilities and other stakeholders on the advantages of using MotorMaster software and ASDs (adjustable speed drives).
Order no. DOE/GO-10097-420.

National Renewable Energy Laboratory

Advanced Direct-Contact Condensers. NREL Business Ventures (Fact sheet). October 1997; 2 pp. In contrast to more simple, conventional direct-contact condensers, NREL's ADCC technology uses sophisticated, geometric shapes to provide optimal surface area for condensing spent steam in an electric power plant or industrial process. As this fact sheet explains, there is a potentially huge global market for this technology, which can significantly improve a plant's power production efficiency and generating capacity.
Order no. FS-280-23205.

National Renewable Energy Laboratory Information Resources Catalogue—1997: A Collection of Renewable Energy and Energy Efficiency Information Resources. December 1997; 86 pp. Our fourth annual *Information Resources Catalogue* describes recent NREL publications and services that will keep you up to date on the latest advances in renewable energy and energy efficiency.
Order no. BK-330-23593.

National Renewable Energy Laboratory Public Affairs Online Fact Sheets. From biofuels to windpower, from buildings to photovoltaics, these fact sheets provide easy-to-read summaries of the principal technologies being advanced through research, development, and deployment activities at the National Renewable Energy Laboratory.

Biofuels Research: Developing a Clean, Domestic Transportation Fuel. July 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/biofuels.html* or *http://www.nrel.gov/lab/ pao/biofuels.pdf*

Biomass Energy: Converting Biomass into Useful Energy. June 1998; 3 pp. Available online only at: *http://www.nrel.gov/lab/pao/biomass_energy.html*

Biomass Power Research: Making Electricity from Trash and Other Biomass Resources. July 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/*

biomass_power.html or *http://www.nrel.gov/lab/pao/biomass_power.pdf*

Building a Better Trombe Wall. August 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/trombe_wall.html* or *http://www.nrel.gov/lab/pao/trombe_wall.pdf*

Buildings Research: Developing Energy Efficiency and Renewable Energy Technologies for Buildings. July 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/building_energy.html* or *http://www.nrel.gov/ lab/pao/building_energy.pdf*

Geothermal Energy: Extracting Thermal Energy from Deep Within the Earth. June 1998; 3 pp. Available online only at: *http://www.nrel.gov/lab/pao/geothermal_energy.html*

Hydroelectric Power: Turning Water's Mechanical Energy into Electricity. June 1998; 3 pp. Available online only at: *http://www.nrel.gov/lab/pao/hydroelectric.html*

Hydrogen Research: Developing Sustainable Technologies for the 21st Century. July 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/hydrogen.html* or *http://www.nrel.gov/lab/pao hydrogen.pdf*

NREL's Alternative Fuels User Facility: Developing Cleaner Fuels for Vehicles. August 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/afuf.html* or *http://www.nrel.gov/lab/pao/afuf.pdf*

NREL's Field Test Laboratory Building: Making Fuels, Power, and Chemicals. August 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/ftlb.html* or *http://www.nrel.gov/lab/pao/ftlb.pdf*

NREL's Hybrid Electric Vehicle Research. August 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/hev.html* or *http://www.nrel.gov/lab/pao/hev.pdf*

NREL's National Wind Technology Center: Harnessing the Wind. July 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/wind.html* or *http://www.nrel.gov/lab/pao/wind.pdf*

NREL's Outdoor Test Facility: Advancing Photovoltaic Technology. July 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/otf.html* or *http://www.nrel.gov/lab/pao/otf.pdf*

NREL's Solar Energy Research Facility. August 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/serf.html* or *http://www.nrel.gov/lab/pao/serf.pdf*

NREL's Thermal Test Facility: Developing Technologies to Reduce Energy Use in Buildings. August 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/ttf.html* or *http://www.nrel.gov/lab/pao/ttf.pdf*

NREL's Visitors Center: Making a Statement with Intelligent Building Design. August 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/visitors_center.html* or *http://www.nrel.gov/lab/pao/visitors_center.pdf*


NREL FACTS

NREL's Visitors Center

Photovoltaic Research: Creating Electricity from An Unlimited Resource—Sunlight. July 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/pv_research.html* or *http://www.nrel.gov/lab/pao/pv_research.pdf*

Solar Energy: Tapping into Earth's Largest Energy Resource. June 1998; 3 pp. Available online only at: *http://www.nrel.gov/lab/pao/solar_energy.html*

Solar Thermal Electric Research: Using the Sun's Heat to Generate Electricity. July 1998; 2 pp. Available online only at: *http://www.nrel.gov/lab/pao/solar_thermal.html* or *http://www.nrel.gov/lab/pao/solar_thermal.pdf*

Wind Energy: Low-Cost Electricity from a Clean, Reliable Resource. June 1998; 3 pp. Available online only at: *http://www.nrel.gov/lab/pao/wind_energy.html*

NREL's Research Participant Program (Brochure). March 1998; 6 pp. Through its research participant program, NREL—the nation's leading laboratory for the research and development of renewable energy and energy efficiency technologies—enables those with fresh ideas and talents to contribute to research at the Laboratory. The brochure describes the five categories of participants, and how the latter can go forth to use their newly developed expertise at their home institutions or in their future career pursuits. To obtain copies, contact NREL's Human Resources Office at (303) 384-7588.

Photoelectrochromic "Smart" Windows. NREL Business Ventures (Fact sheet). January 1998; 2 pp. The National Renewable Energy Laboratory is looking for partners to help develop and commercialize photoelectrochromic technology for self-powered, "smart," sunblocking windows. This brief explains the advantages of using this exciting new technology.
Order no. FS-450-23531.

Solar Energy—General

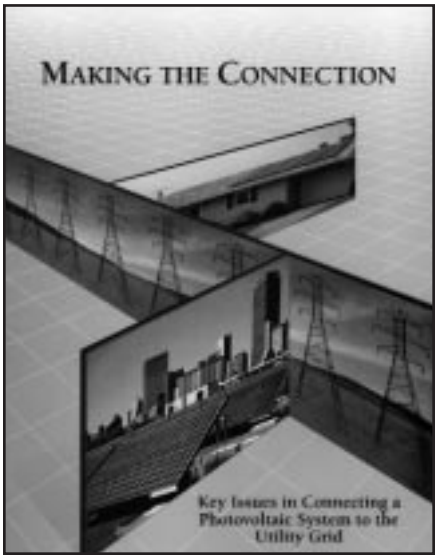
Save with Solar—Summer 1998. Federal Energy Management Program (FEMP) Quarterly Technical Bulletin. July 1998; 1(2): 8 pp. The lead story in this issue discusses what is being done to support the commitment made by the President on June 26, 1997, to install 20,000 solar systems on federal buildings by 2010. Other articles focus on the Pentagon's Federal Energy Saver Showcase, which not only provided improvements in energy efficiency and water conservation, but demonstrated an impressive new hybrid Solar Dish/Stirling Power System; the General Services Administration's new Solar Supply Schedule, which can significantly reduce your procurement lead time and simplify your purchases of renewable energy equipment; and the Sacramento Municipal Utility District (SMUD), the nation's fifth largest public utility, which has installed the world's largest utility-owned distributed PV system.
Order no. DOE/GO-10098-584.

Save with Solar—Spring 1998. Federal Energy Management Program (FEMP) Quarterly Technical Bulletin. April 1998; 1(1): 8 pp. This new quarterly bulletin is being produced under the U.S. Department of Energy's Federal Energy Management Program (FEMP) in support of FEMP's renewable energy program and the President's Million Solar Roofs Initiative. It contains information about today's renewable energy technologies, policies, procurements, and incentives.
Order no. DOE/GO-10098-551.

Solar Energy—Photovoltaics

Creating Sustainable Markets for Solar Home Systems (Market Analysis Brief). February 1998; 4 pp. Based on 20 years of lessons learned in countries of the developing world, NREL analysts offer strategies, considerations, and recommendations for establishing viable markets for solar home systems.
Order no. BR-520-23433.

Making the Connection: Key Issues in Connecting a Photovoltaic System to the Utility Grid (Brochure). June 1998; 6 pp. As detailed in this brochure, connecting residential or small commercial photovoltaic (PV) systems to an existing utility grid has come a long way in recent years, with the resolution of many formerly critical problems. Read about how some of the key issues—building/electrical codes and local covenants, power quality and safety, and metering agreements—are being resolved.
Order no. DOE/GO-10098-523.



Million Solar Roofs (Flyer). October 1997; 2 pp. On June 26, 1997, President Clinton announced the Million Solar Roofs Initiative. The goal is to install one million solar energy systems on buildings across the United States by the year 2010. The flyer explains the importance of the initiative, how it will work, and the types of solar technologies (including NREL's advanced thin-film PV technologies) that will be utilized in this collaborative effort.
Order no. DOE/GO-10097-504.

New Policies Jump-Start Solar Markets (Brochure). March 1998; 4 pp. This PV brochure outlines how a new wave of policy incentives can boost economics and markets for grid-connected photovoltaics and other solar technologies. Conclusions are based on a study of five top cities—Hilo and Honolulu, Hawaii; San Jose and Los Angeles, California; and Long Beach, New York—for a mix of market-based policies, including net metering, rebates, and low-interest loans. Also discussed are system benefits charges, renewables portfolio standard, tax and production incentives, and green pricing. Available online at: *http://www.nrel.gov/ncpv/pdfs/jump_start.pdf*
Order no. DOE/GO-10098-520.

NREL PV Working with Industry—Second Quarter 1998 (Newsletter). September 1998; 12 pp. Read this edition of the newsletter to learn about the Thin Film PV Partnership's strategy to advance the technologies based on the three materials considered front runners for enabling PV to become competitive in large energy markets: amorphous silicon (a-Si), cadmium telluride, and copper indium diselenide. Other articles focus on the activities of the national PV teams, each of which must find a way to successfully address technical issues, surmount challenges, and reach its long-term goals, and the prospects for the early favorite among the thin-film PV technologies—a-Si.
Order no. BR-210-24692.

NREL PV Working with Industry—First Quarter 1998 (Newsletter). March 1998; 12 pp. Read this edition of the newsletter to learn about the recommendations of a recent White House-appointed panel regarding the need to boost the level of funding for development of large-volume, low-cost PV production, and to support R&D on systems integration and on balance-of-systems components such as inverters. Another story features NREL's exciting efforts to build a "virtual laboratory" through real-time data sharing with its customers: more than 50 companies currently use the Internet to receive PV cell measurement and analysis results from NREL's Measurements and Characterization Center.
Order no. BR-210-23996.

NREL PV Working with Industry—Fall 1997 (Newsletter). October 1997; 12 pp. This issue looks at the outdoor test capabilities of NREL's National Center for Photovoltaics—capabilities that are the result of more than 20 years of testing PV devices and optical materials for the solar energy industry. Other articles focus on the 26th IEEE Photovoltaic Specialists Conference and an inside look at the Million Solar Roofs Initiative, which aims to install solar energy systems on

one million U.S. buildings by 2010. Also available online at *http://www.nrel.gov/ncpv/pdfs/pvwwi17.pdf*
Order no. BR-210-23790.

Photovoltaic Energy Program Contract Summary, Fiscal Year 1997 (Booklet). May 1998; 162 pp. The National Photovoltaics Program comprises three principal elements: Research and Development activities, which generate new ideas, test the latest scientific theories, and push the limits of PV efficiencies in laboratory and prototype materials and devices; Technology Development Activities, which apply laboratory innovations to products to improve PV technology and the manufacturing techniques used to produce PV systems for the market; and Systems Engineering and Applications, which help to improve PV systems and validate the improvements through tests, measurements, and deployment of prototypes. This comprehensive document summarizes FY 1997 contract projects that supported these efforts.
Order no. DOE/GO-10098-556.

Photovoltaic Energy Program Overview, Fiscal Year 1997 (Booklet). February 1998; 28 pp. The National Photovoltaics Program, a joint effort of DOE, the national laboratories, and the U.S. PV industry, had exciting advances and significant accomplishments in fiscal year 1997. The booklet provides details of new products introduced, manufacturing processes improved, capacity expanded, and new materials explored. The Million Solar Roofs Initiative will build on the solid foundation of steady research progress in laboratories and universities,

industry investment in new technology and capacity, and the burgeoning solar power market both here and abroad. Available online at: *http://www.eren.doe.gov/pv/PVenrgyPOfy97.pdf*
Order no. DOE/GO-10098-539.

Photovoltaics and Commercial Buildings—A Natural Match (Brochure). September 1998; 4 pp. This study highlights strategic opportunities and locations for using photovoltaics to power businesses. Building-integrated photovoltaics, for example, has been applied with great success in niche markets such as Hawaii. Available online at: *http://www.nrel.gov/ncpv/pdfs/pv_com_bldgs.pdf*
Order no. DOE/GO-10098-657.

Photovoltaics Promise...The Federal Role: National Center for Photovoltaics PV FAQs (Fact sheet). June 1998; 2 pp. Welcome to the inaugural edition of PV FAQs! This new publication of the National Center for Photovoltaics (a joint effort of NREL and Sandia National Laboratories) will bring you the latest news of advances in PV technology research, development, and demonstration.
Order no. FS-520-24588.

Solar Energy—Radiation

RReDC: An On-line Reference Library of Renewable Energy Resources (Resource Assessment Brief). September 1997; 2 pp. This fact sheet provides information about our on-line data to specialists in energy research and data modeling as well as to educators, students, solar architects and engineers, analysts, and others. The document explains that, in addition to the solar radiation data on the RReDC (Renewable Resources Data Center), there are also many links to other national and international solar databases and to data on wind energy and biomass resources in the United States.
Order no. FS-560-23153.

Solar Energy—Thermal

Concentrating Solar Power Program Fact Sheets. The U.S. Department of Energy's Concentrating Solar Power (CSP) Program—formerly the Solar Thermal Electric Program—develops technologies that convert sunlight into electricity efficiently and with minimum effect on the environment. Check out the following nine fact sheets for details of these exciting new CSP technologies.

Concentrating Solar Power Program Overview. April 1998; 4 pp.
Order no. DOE/GO-10098-567.

Markets for Concentrating Solar Power. April 1998; 2 pp.
Order no. DOE/GO-10098-563.

Solar Dish/Engine Systems. April 1998; 2 pp.
Order no. DOE/GO-10097-407.

Solar Power Towers. April 1998; 2 pp.
Order no. DOE/GO-10097-406.

Solar Trough Systems. April 1998; 2 pp.
Order no. DOE/GO-10097-395.

Solar Two. April 1998; 2 pp.
Order no. DOE/GO-10098-562.

SolMaT—The Solar Thermal Manufacturing Technology Initiative. April 1998; 2 pp.
Order no. DOE/GO-10098-566.

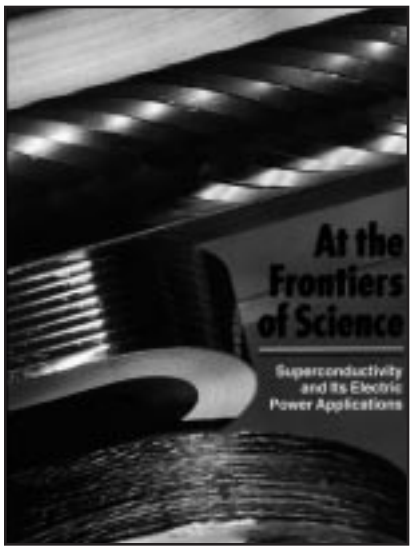
SunLab—Advancing Concentrating Solar Power Technology. April 1998; 2 pp.
Order no. DOE/GO-10098-565.

SunLab Test Facilities.
April 1998; 2 pp.
Order no. DOE/GO-10098-564.

Concentrating Solar Power Strategic Plan Summary (Brochure). May 1998; 4 pp. Over the past two decades, the U.S. Department of Energy—together with industry—has pursued a focused program of research, development, and demonstration in order to position concentrating solar power (CSP) technologies closer to commercialization. Read about the CSP Program's continuing efforts to reduce costs and improve reliablity while also addressing the many economic and political barriers faced by any emerging technology.
Order no. DOE/GO-10098-542.

Superconductivity

At the Frontiers of Science: Superconductivity and Its Electric Power Applications (Booklet). July 1998; 20 pp. As this informative new publication explains, we are moving ever closer to seeing practical electric power devices and energy systems based on high-temperature superconducting (HTS) technology. Indeed, the next decade may witness the perfection of a variety of superconducting manufacturing techniques and the introduction of products incorporating HTS technology.
Order no. DOE/GO-10098-434.



Transportation

Alternative Fuel News: Official Publication of the U.S. Department of Energy's Clean Cities Network and the Alternative Fuels Data Center (Newsletter). July 1998; 2(3): 16 pp. This issue of the official publication of the Clean Cities Network and the AFDC features stories ranging from President Clinton's proclamation of May 31-June 6 as National Alternative Fuels Week, thus spreading the alternative fuels message to more and more people across the country; the Clean Cities Talk Show featuring John McLaughlin of "McLaughlin Group" fame; the five new partners that recently entered the Clean Cities Hall of Fame; and a detailed listing of 1998 Clean Cities Coalition Award Winners. Available online at: *http://www.afdc.doe.gov/AltFuelNews/AFNewsV2-3.pdf*
Order no. BR-540-25020.

Alternative Fuel News: Official Publication of the U.S. Department of Energy's Clean Cities Network and the Alternative Fuels Data Center (Newsletter). May 1998; 2(2): 16 pp. The great debate is on! With the transportation industry currently so dependent on petroleum (and the serious energy security and economic implications that this situation presents), should we mandate certain vehicle owners to use alternative fuels, or should we propose incentives instead? Find out the details of this growing debate—as well as the other hot developments in the alternative fuels community—in this issue of *Alternative Fuel News.* Available online at: *http://www.afdc.doe.gov/AltFuelNews/AFNewsV2-2.pdf*
Order no. BR-540-24481.

Alternative Fuel News: Official Publication of the U.S. Department of Energy's Clean Cities Network and the Alternative Fuels Data Center (Newsletter). March 1998; 2(1): 16 pp. This issue features stories on the opportunities presented by the Kyoto Protocol to produce cleaner transportation technologies; the plans to build new ethanol (E85—85% ethanol, 15% gasoline) infrastructures, which should significantly reduce tailpipe emissions that cause ozone and carbon dioxide emissions that contribute to global warming; and the major automakers' display of their commitment to advanced automotive technologies at the Los Angeles and Detroit Auto Shows, including Ford's future E85 "muscle car," the Mustang Super Stallion. Available online at: *http://www.afdc.doe.gov/AltFuelNews/AFNewsV2-1.pdf*
Order no. BR-540-23471.

Alternative Fuel News: Official Publication of the U.S. Department of Energy's Clean Cities Network and the Alternative Fuels Data Center (Newsletter). December 1997; 1(2): 16 pp. The major automakers have really stepped up their alternative fuel vehicle (AFV) offerings for the 1998 model year. In the second issue of *Alternative Fuel News,* check out the AFVs that will be gracing the showrooms of Ford, Chrysler, General Motors, and American Honda, as well as a list of upcoming vehicles for the 1999 model year and beyond. Available online at: *http://www.afdc.doe.gov/AltFuelNews/AFNewsV1-2.pdf*
Order no. BR-425-23470.

Alternative Fuel News: Official Publication of the U.S. Department of Energy's Clean Cities Network and the Alternative Fuels Data Center (Newsletter). September 1997; 1(1): 16 pp. This exciting first issue of *Alternative Fuel News* is loaded with information and fresh perspectives on the important issues that affect the alternative fuels industry. The cover story reviews DOE's Third National Clean Cities Conference, followed by an interview with former Energy Secretary Federico Peña and many familiar features from previous newsletters (*Clean Cities Drive* and *AFDC Update*)

such as Hot off the Press, Coordinator's Corner, and At the Pump. And, because we'll be bringing all this information to you every two months instead of quarterly, the information will be more timely than ever. Available online at: *http://www.afdc.doe.gov/AltFuelNews/AFNewsV1-1.pdf*
Order no. BR-425-22786.

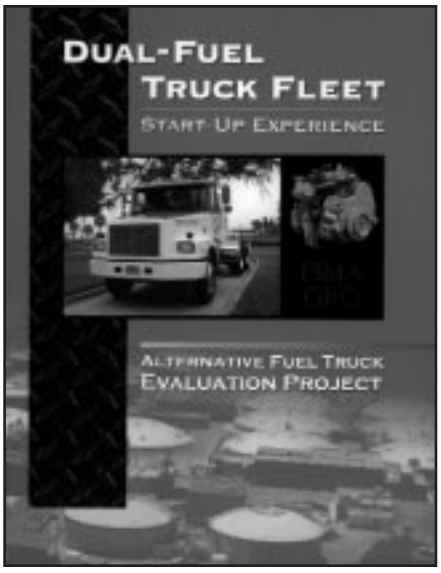
Alternative Fuels and Vehicles Information Resources (Brochure). May 1998; 2 pp. The U.S. Department of Energy's Office of Transportation Technologies (OTT) has many programs designed to help our nation become less dependent on foreign oil and our vehicles more fuel efficient. As this informative new brochure explains, these programs include the Clean Cities Web site and Hotline, the *Alternative Fuel Vehicle Fleet Buyer's Guide* and Alternative Fuels Data Center, and the AFDC Hotline and OTT Web site.
Order no. DOE/GO-10098-578.

Alternative Fuels in Trucking—June 1998 (Newsletter). June 1998; 6(4): 8 pp. The lead story in this issue discusses Cummins' heavy-duty propane engine, the B.59LPG (liquefied petroleum gas), which recently became the first dedicated heavy-duty propane gas engine to receive certification to the 1999 EPA Clean Fuel Fleet Vehicle Low Emissions Vehicle standard. Additional stories look at Gasalarm Systems' new Series GS2000 gas monitor, which should help advance alternative fuel use in the trucking industry, and the lessons learned from experiences at the liquefied and compressed natural gas station in Ontario, California.
Order no. BR-540-23965.

Alternative Fuels in Trucking—March 1998 (Newsletter). March 1998; 6(3): 8 pp. Although ethanol, a renewable energy fuel produced from feedstock crops, has more desirable emissions characteristics than conventional automotive fuels, it has rarely been tested in heavy-duty vehicles in high-percentage blends. However, an NREL/DOE study of three snowplow and road maintenance trucks (two fueled with E95—a 95%/5% blend of ethanol— and one with gasoline) in Minneapolis concluded that, with some refinements in maintenance and repair and a likely reduction in prices, the use of ethanol in heavy-duty vehicles (HDVs) could be a commercial success. For more details on this and other major developments in alternative fuels for HDVs, order your copy today.
Order no. BR-540-23718.

Alternative Fuels in Trucking—October 1997 (Newsletter). October 1997; 6(2) 8 pp. The lead story in this issue discusses the future of fuels for heavy-duty trucks. Other articles look at tax relief for liquefied natural gas (LNG) (giving LNG a tax advantage over its chief rival, diesel), the status of the Federal Clean Fuel Fleet Program, and the recent success of the Cummins Engine Company's B5.9G engine in receiving double certification on emissions requirements from both EPA and the California Air Resources Board.
Order no. BR-540-23440.

Dual-Fuel Truck Fleet: Start-Up Experience. Alternative Fuel Truck Evaluation Project (Brochure). September 1998; 8 pp. Although dual-fuel engine technology has been around for several years, it has only recently moved toward full-scale operational capability for heavy-duty truck applications. NREL's Alternative Fuel Truck Evaluation Project has evaluated the merits of the technology and the costs of implementation for various fleets. The brochure provides a handy bibliography for those wishing to learn more.
Order no. BR-540-25118.



Guide to the Emissions Certification Procedures for Alternative Fuel Aftermarket Conversions (Report). January 1998; 68 pp. This first-of-its-kind document, produced for DOE's Office of Transportation Technologies, guides the reader through the complex regulations for certifying the emissions of converted alternative fuel vehicles. The publication will be available through the Alternative Fuels Data Center home page on the World Wide Web *(http://www.afdc.doe.gov)*, and will also be distributed through the Alternative Fuels Hotline at 1-800-423-1DOE.
Order no. TP-540-22757.

Perspectives on AFVs: 1996 Federal Fleet Driver Survey (Booklet). September 1997; 70 pp. At the behest of the U.S. Department of Energy, the National Renewable Energy Laboratory has undertaken several projects to evaluate the performance and acceptability of light-duty alternative fuel vehicles (AFVs) compared to similar gasoline vehicles. The results of our detailed survey of federal fleet drivers were pretty good: about 80% of drivers surveyed indicated that they were very satisfied or leaning toward being satisfied overall with their AFVs. Order your copy of *Perspectives on AFVs* to get the complete, detailed picture of this wide-ranging, in-depth survey. To obtain copies of this publication, please contact the Alternative Fuels Data Center at 1-800-423-1DOE.
Order no. BK-540-22721.

Raley's LNG Truck Fleet Start-Up Experience: Alternative Fuel Truck Evaluation Project (Brochure). October 1997; 8 pp. NREL is conducting this project to compare the operational, maintenance, and emissions performance of alternative fuel and diesel fuel trucks. This brochure highlights the start-up experience of Raley's Distribution Center in Sacramento, California, the first demonstration site of the project.
Order no. BR-540-23402.

Using CNG Trucks in National Parks (Booklet). May 1998; 8 pp. This new publication describes lessons learned from the National Park Service's experience with a demonstration of a compressed natural gas refuse hauler.
Order no. BR-540-24744.

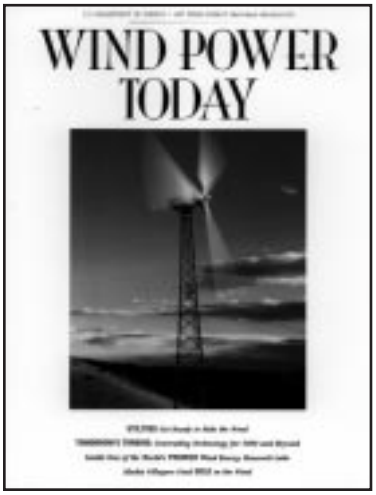
Utilities

State Renewable Energy News (Newsletter). 1998. This newsletter is a compilation of utility-oriented renewable energy activities in the states. It is prepared by the NARUC (National Association of Regulatory Utility Commissioners) Subcommittee on Renewable Energy, and is issued three times a year. Available online only at: *http://www.nrel.gov/analysis/emaa/projects/sren*

Wind Energy

International Energy Agency (IEA) Wind Energy Newsletter, January 1998 (Online document). January 1998. This newsletter presents a complete list of recent and ongoing collaborative projects, or Tasks, undertaken for the Wind Energy R&D Implementing Agreement, as well as 16 country reports providing details of recent developments affecting wind energy in these countries. Available online only at: *http://www.eren.doe.gov/ieawind*

Wind Power Today: U.S. Department of Energy 1997 Wind Energy Program Highlights (Booklet). April 1998; 36 pp. This document describes how the federal wind program is helping utilities across the country use wind to generate electricity, developing wind technology to compete in the global market, and enabling remote villages in Alaska to harness wind energy for use in the harsh arctic climate. Order no. DOE/GO-10098-550.



Technical Reports

NREL Technical Reports provide technical information on research and analysis projects performed by NREL staff and subcontractors. They are intended for technical professionals. Unless otherwise noted, NREL technical reports are available in limited quantities from NREL's Document Distribution Service at (303) 275-4363 (phone), (303) 275-4053 (fax), or Sally_Evans @nrel.gov (e-mail).

Alternative Fuels

Lusk, P. Methane Recovery from Animal Manures: The Current Opportunities Casebook. September 1998; 155 pp. Work performed by Resource Development Associates, Washington, D.C.
Order no. SR-580-25145.

Rooney, T. Lignocellulosic Feedstock Resource Assessment. September 1998; 123 pp. Work performed by NEOS Corporation, Lakewood, Colorado.
Order no. SR-580-24189.

Sheehan, J.; Camobreco, V.; Duffield, J.; Graboski, M.; Shapouri, H. Overview of Biodiesel and Petroleum Diesel Life Cycles. May 1998; 60 pp.
Order no. TP-580-24772.

Tyson, K.S., ed. Biodiesel Research Progress 1992-1997. April 1998; 303 pp. Prepared by Information Resources, Inc., and DynCorp Information and Engineering Technology.
Order no. SR-580-24433.

Volkin, P. Front Range Forest Health Partnership Phase I Feasibility Study. September 1998; 130 pp. Work performed by NEOS Corporation, Lakewood, Colorado.
Order no. SR-580-23805.

Whitney, K.A. Determination of Alternative Fuels Combustion Products: Phase I Report. September 1997; 160 pp. Work performed by Southwest Research Institute, San Antonio, Texas.
Order no. TP-425-7528.

Wooley, R.J. Continuous Countercurrent Chromatographic Separator for the Purification of Sugars from Biomass Hydrolyzate. December 1997; 78 pp.
Order no. TP-580-23907.

Biomass Power

Adamian, S. Rural Electrification: Waste Biomass Russian Northern Territories. February 1998; 140 pp. Work performed by ECOTRADE, Inc., Glendale, California.
Order no. SR-210-24040.

Mann, M.K.; Spath, P.L. Life Cycle Assessment of a Biomass Gasification Combined-Cycle System. December 1997; 159 pp. Available online at: *http://www.eren.doe.gov/biopower/life_cycle.html*
Order no. TP-430-23076.

Morris, G. Implications of Deregulation for Biomass and Renewable Energy in California. July 1998; 55 pp. Work performed by Future Resources Associates, Inc., Berkeley, California.
Order no. SR-570-24851.

Petersen, G., ed. Biological and Chemical Technologies Research at OIT: Annual Summary Report, FY 1997. March 1998; 103 pp. *To obtain copies of this report, please contact Gene Petersen at (303) 275-2994.*
Order no. TP-570-24182.

Buildings

Farhar, B.C.; Buhrmann, J. Public Response to Residential Grid-Tied PV Systems in Colorado: A Qualitative Market Assessment. July 1998; 83 pp.
Order no. TP-550-24004.

Holt, E.A.; Fang, J.M. New Hampshire Retail Competition Pilot Program and the Role of Green Marketing (Topical Issues Brief). November 1997; 28 pp.
Order no. TP-260-23446.

Manufactured Home Energy Audit User's Manual. September 1997; 156 pp. *To obtain copies of the manual and software, contact the Energy Science and Technology Software Center, P.O. Box 1020, Oak Ridge, TN 37831, (423) 576-2606.*

Slayzak, S.J.; Ryan, J.P. Instrument Uncertainty Effect on Calculation of Absolute Humidity Using Dewpoint, Wet-Bulb, and Relative Humidity Sensors. April 1998; 9 pp. Prepared for Solar 98: Renewable Energy for the Americas Conference, 13-18 June 1998, Albuquerque, New Mexico.
Order no. CP-550-24523.

Chemical Technologies

Glatzmaier, G.; Blake, D.; Showalter, S. Assessment of Methods for Hydrogen Production Using Concentrated Solar Energy. January 1998; 25 pp.
Order no. TP-570-23629.

Phillips, J.A. Managing America's Solid Waste. September 1998; 172 pp. Work performed by J.A. Phillips & Associates, Boulder, Colorado.
Order no. SR-570-25035.
Obozov, A.J.; Loscutoff, W.

Energy Policy and Analysis

Opportunities for Renewable Energy Sources in Central Asian Countries. July 1998; 28 pp.
Order no. CP-210-25047.

Hydrogen

Proceedings of the 1997 U.S. DOE Hydrogen Program Review, 21-23 May 1997, Herndon, Virginia. Golden, CO: National Renewable Energy Laboratory, October 1997; 558 pp.
Order no. CP-430-23722.

Proceedings of the 1998 U.S. DOE Hydrogen Program Review, 28-30 April 1998, Alexandria, Virginia (Vols. I and II). Golden, CO: National Renewable Energy Laboratory, August 1998; Vol. I: 425 pp.; Vol. II: 391 pp.
Order no. CP-570-25315.

Solar Energy—Photovoltaics

Abulfotuh, F.A.; Balcioglu, A.; Wangensteen, T.; Moutinho, H.R.; Hassoon, F.; Al-Douri, A.; Alnajjar, A.; Kazmerski, L.L. Study of the Defect Levels, Electro-optics, and Interface Properties of Polycrystalline CdTe and CdS Thin Films and Their Junction. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/defectlevels.pdf*

Ahrenkiel, R.K.; Ahrenkiel, S.P.; Al-Jassim, M.M.; Venkatasubramanian, R. Electronic and Mechanical Properties of Ge Films Grown on Glass Substrates. September 1997; 4 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/gefilms.pdf*

Ahrenkiel, R.K.; Johnston, S. Contactless Measurement of Recombination Lifetime in Photovoltaic Materials. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/contactless.pdf*

Ahrenkiel, R.K.; Levi, D.H.; Johnston, S.; Song, W.; Mao, D.; Fischer, A. Photoconductive Lifetime of CdS Used in Thin-Film Solar Cells. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/photoconductive.pdf*

Albin, D.; Rose, D.; Dhere, R.; Levi, D.; Woods, L.; Swartzlander, A.; Sheldon, P. Comparison of Close-Spaced Sublimated and Chemical Bath Deposited CdS Films: Effects on CdTe Solar Cells. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/comparison.pdf*

Al-Jassim, M.M.; Dhere, R.G.; Jones, K.M.; Hasoon, F.S.; Sheldon, P. Morphology, Microstructure, and Luminescent Properties of CdS/CdTe Films. August 1998; 5 pp. Presented at the 2nd World Conference and Exhibition on Photovoltaic Solar Energy Conversion; 6-10 July 1998; Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/jassim.pdf*

Arya, R.; Carlson, D.; Chen, L.; Ganguly, G.; He, M.; Lin, G.; Middya, R.; Skibo, S.; Wood, G. Amorphous Silicon Research: Final Technical Report, 13 September 1994-28 February 1998. June 1998; 55 pp. Work performed by Solarex, Newtown, Pennsylvania.
Order no. SR-520-24854.

Basol, B.M.; Kapur, V.K.; Leidholm. C. R.; Halani, A.; Roe, R.; Norsworthy, G. Application of CIS to High-Efficiency PV Module Fabrication: Phase 3 Final Technical Report. August 1998; 25 pp. Work performed by International Solar Electric Technology, Inglewood, California.
Order no. SR-520-25218.

Bedair, S.M.; El-Masry, N.A. New Approaches for High-Efficiency Solar Cells: Final Report. December 1997; 121 pp. Work performed by North Carolina State University, Raleigh, North Carolina.
Order no. SR-520-23266.

Birkmire, R.W.; Phillips, J.E. Processing and Modeling Issues for Thin-Film Solar Cell Devices: Final Report. November 1997; 167 pp. Work performed by Institute of Energy Conversion, University of Delaware, Newark, Delaware. Available online at: *http://www.nrel.gov/ ncpv/pdfs/iec_93-9.html*
Order no. SR-520-23835.

Brog, T.K. Commercial Production of Thin Film CdTe Photovoltaic Modules: Final Report. October 1997; 36 pp. Work performed by Golden Photon, Inc., Golden, Colorado.
Order no. SR-520-23733.

Ciszek, T.F.; Wang, T.H. Growth and Properties of Silicon Filaments for Photovoltaic Applications. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/silicon.pdf*

Ciszek, T.F.; Wang, T.H.; Doolittle, W.A.; Rohatgi, A. Minority-Carrier Lifetime Degradation in Silicon Co-Doped with Iron and Gallium. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/97ieeefe.pdf*

Compaan, A.D.; Matulionis, I.; Nakade, S. Optimization of Laser Scribing for Thin-Film PV Modules: Final Technical Progress Report, 12 April 1995-11 October 1997. June 1998; 43 pp. Work performed by University of Toledo, Toledo, Ohio.
Order no. SR-520-24842.

Contreras, M.A.; Eggas, B.; Dippo, P.; Webb, J.; Granata, J.; Ramanathan, K.; Asher, S.; Swartzlander, A.; Noufi, R. On the Role of Na and Modifications to Cu(In,Ga)Se_2 Absorber Materials Using Thin-MF (M=Na, K, Cs) Precursor Layers. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/ontheroleof.pdf*

Coutts, T.J.; Wu, X.; Sheldon, P.; Rose, D.H. Development of High-Performance Transparent Conducting Oxides and Their Impact on the Performance of CdS/CdTe Solar Cells. July 1998; 5 pp. Prepared for presentation at the 2nd World Photovoltaic Conference on Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http:// www.nrel.gov/ncpv/pdf/coutts.pdf*

Deb, S.K.; Ellingson, R.; Ferrere, S.; Frank, A.J.; Gregg, B.A.; Nozik, A.J.; Park, N.; Schlichthorl, G. Photochemical Solar Cells Based on Dye-Sensitization of Nanocrystalline TiO_2. July 1998; 5 pp. Presented at the 2nd World Conference and Exhibition on Photovoltaic Solar Energy Conversion; 6-10 July 1998; Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/phtochem.pdf*

Deb, S.K.; Ferrere, S.; Frank, A.J.; Gregg, B.A.; Huang, S.Y.; Nozik, A.J.; Schlichthorl, G.; Zaban, A. Photochemical Solar Cells Based on Dye-Sensitization of Nanocrystalline TiO_2. September 1997; 4pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/ieee-ppr.pdf*

del Cueto, J.A.; McMahon, T.J. Performance of Single-Junction a-Si Modules Under Varying Conditions in the Field. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http:// www.nrel.gov/ncpv/pdf/cueto.pdf*

Deng, X.; Jones, S.J.; Liu, T.; Izu, M. Development of High, Stable-Efficiency Triple-Junction a-Si Alloy Solar Cells: Final Technical Report. April 1998; 154 pp. Work performed by Energy Conversion Devices, Inc., Troy, Michigan.
Order no. SR-520-24580.

Dhere, R.; Rose, D.; Albin, D.; Asher, S.; Al-Jassim, M.; Cheong, H.; Swartzlander, A.; Moutinho, H.; Coutts, T.; Sheldon, P. Influence of CdS/CdTe Interface Properties on the Device Properties. September 1997; 5 pp. Prepared for the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http:// www.nrel.gov/ncpv/pdf/influence.pdf*

Emery, K.; Dunlavy, D.; Field, H.; Moriarty, T. Photovoltaic Spectral Responsivity Measurements. July 1998; 5 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http:// www.nrel.gov/ncpv/pdf/photovol.pdf*

Field, H. Solar Cell Spectral Response Measurement Errors Related to Spectral Band Width and Chopped Light Waveform. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/solarcellspectral.pdf*

Friedman, D.J.; Geisz, J.F.; Kurtz, S.R.; Olson, J.M. 1-eV GaInNAs Solar Cells for Ultra-High-Efficiency Multijunction Devices. July 1998; 6 pp. Prepared for presentation at the 2nd World Conference on PV Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/solarcell.pdf*

Gallagher, A.; Barzen, S.; Childs, M.; Laracuente, A. Atomic-Scale Characterization of Hydrogenated Amorphous-Silicon Films and Devices: Annual Subcontract Report, 15 April 1994-14 March 1998. June 1998; 27 pp. Work performed by National Institute of Standards and Technology, Boulder, Colorado.
Order no. SR-520-24760.

Gao, W.; Lee, S.H.; Xu, Y.; Benson, D.K.; Deb, S.K.; Branz, H.M. Wide-Gap a-SiC:H PV-Powered Electrochromic Window Coating. July 1998; 5 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/widegap.pdf*

Gessert, T.A.; Sheldon, P.; Li, X.; Dunlavy, D.; Niles, D.; Sasala, R.; Albright, S.; Zadler, B. Studies of ZnTe Back Contacts to CdS/CdTe Solar Cells. New York: Institute of Electrical and Electronics Engineers, September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/studiesofZnTe.pdf*

Gordon, R.G.; Kramer, K.; Pang, D.; Teff, D.; Liang, H.; Liu, X. Optimization of Transparent and Reflecting Electrodes for Amorphous Silicon Solar Cells: Final Technical Report. September 1998; 36 pp. Work performed by Harvard University, Cambridge, Massachusetts.
Order no. SR-520-25424.

Guha, S. Amorphous Silicon Research: Final Technical Progress Report, 1 August 1994-28 February 1998. May 1998; 96 pp. Work performed by United Solar Systems Corp., Troy, Michigan.
Order no. SR-520-24724.

Guha, S. Amorphous Silicon Research: Phase III Technical Progress Report, 1 August 1996-31 July 1997. November 1997; 43 pp. Work performed by United Solar Systems Corporation, Troy, Michigan.
Order no. SR-520-23543.

Guha, S. Thin-Film Amorphous Silicon Alloy Research Partnership: Final Technical Progress Report, 2 February 1995-28 February 1998. May 1998; 69 pp. Work performed by United Solar Systems Corporation, Troy, Michigan.
Order no. SR-520-24723.

Hall, R.B.; Rand, J.A.; Ford, D.H.; Ingram, A.E. Light-Trapped, Interconnected, Silicon-Film™ Modules: Final Technical Status Report. April 1998; 30 pp. Work performed by AstroPower, Inc., Newark, Delaware.
Order no. SR-520-24641.

Han, D. Experimental Study of the Factors Governing the Staebler-Wronski Photodegradation Effect in a-Si:H Solar Cells: Final Subcontract Report. May 1998; 51 pp. Work performed by University of North Carolina, Chapel Hill, North Carolina.
Order no. SR-520-24741.

Hasoon, F.; Al-Jassim, M.M.; Sheldon, P.; Al-Douri, A.A.J.; Alnajjar, A.A. Morphology of CdS Thin Films Deposited on SnO_2-Coated Glass Substrates. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/morph.pdf*

Holley, W.W.; Agro, S.C. Advanced EVA-Based Encapsulants: Final Report, January 1993-June 1997. September 1998; 221 pp. Work performed by STR, Inc., Enfield, Connecticut.
Order no. SR-520-25296.

Jeffrey, F. Photovoltaic Manufacturing Technology Monolithic Amorphous Silicon Modules on Continuous Polymer Substrates: Annual Technical Progress Report, 5 July 1996-31 December 1997. August 1998; 29 pp. Work performed by Iowa Thin Film Technologies, Inc., Ames, Iowa.
Order no. SR-520-25236.

Jester, T.L. Photovoltaic Cz Silicon Module Improvements: Annual Technical Progress Report, 9 November 1996-8 November 1997. September 1998; 29 pp. Work performed by Siemens Solar Industries, Camarillo, California.
Order no. SR-520-25269.

Keyes, B.M.; Hasoon, F.; Dippo, P.; Balcioglu, A.; Abulfotuh, F. Influence of Na on the Electro-Optical Properties of $Cu(In,Ga)Se_2$. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online at: *http://www.nrel.gov/ncpv/pdf/influenceofNa.pdf.*

King, R.R.; Mitchell, K.W.; Jester, T.L. Photovoltaic Cz Silicon Module Improvements: Annual Technical Progress Report, 9 November 1995-8 November 1996. February 1998; 43 pp. Work performed by Siemens Solar Industries, Camarillo, California.
Order no. SR-520-24065.

King, D.E.; Pern, F.J.; Pitts, J.R.; Bingham, C.E.; Czanderna, A.W. Optical Changes in Cerium-Containing Glass as a Result of Accelerated Exposure Testing. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/iee97two.pdf*

Kroposki, B.; Hansen, R. Technical Evaluation of Four Amorphous Silicon Systems at NREL. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/kroposki.pdf*

Kurtz, S.R.; Myers, D.; Olson, J.M. Projected Performance of Three- and Four-Junction Devices Using GaAs and GaInP. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/projected.pdf*

Kurtz, S.R.; Olson, J.M.; Friedman, D.J.; Reedy, R. Effect of Front-Surface Doping on Back-Surface Passivation in $Ga_{0.5}In_{0.5}P$ Cells. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/effectfront.pdf*

Levi, D.H.; Woods, L.M.; Albin, D.S.; Gessert, T.A.; Niles, D.W.; Swartzlander, A.; Rose, D.H.; Ahrenkiel, R.K.; Sheldon, P. Back Contact Effects on Junction Photoluminescence in CdTe/CdS Solar Cells. September 1997; 6 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/backcontact.pdf*

Levi, D.H.; Woods, L.M.; Albin, D.S.; Gessert, T.A.; Reedy, R.C.; Ahrenkiel, R.K. Influence of Grain Boundary Diffusion on the Electro-Optical Properties of CdTe/CdS Solar Cells. July 1998; 5 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/levi.pdf*

McMahon, T.J.; von Roedern, B. Effects of Light Intensity on Current Collection in Thin-Film Solar Cells. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/effectlight.pdf*

McNutt, P.; Kroposki, B.; Hansen, R.; Algra, K.; DeBlasio, R. Interim Test Methods and Procedures for Determining the Performance of Small Photovoltaic Systems. July 1998; 5 pp. Prepared for the 2nd World Conference and Exhibition on Photovoltaic Solar Energy Conversion; 6-10 July 1998, Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/develop.pdf*

McNutt, P.; Kroposki, B.; Hansen, R.; DeBlasio, R. Interim Test Methods and Procedures for Determining the Performance of Small Photovoltaic Systems. July 1998; 24 pp.
Order no. TP-520-25077.

Mitchell, R.L.; Witt, C.E.; Thomas, H.P.; Ruby, D.S.; King, R.; Aldrich, C.C. Progress Update on the U.S. Photovoltaic Manufacturing Technology Project. October 1997; 6 pp. Prepared for the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/mitch.pdf*

Moore, J.T.; Wang, T.H.; Heben, M.J.; Douglas, K.; Ciszek, T.F. Fused-Salt Electrodeposition of Thin-Layer Silicon. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http:// www.nrel.gov/ncpv/pdf/ieee26pa.pdf*

Moutinho, H.R.; Al-Jassim, M.M.; Abufoltuh, F.A.; Levi, D.H.; Dippo, P.C.; Dhere, R.G.; Kazmerski, L.L. Studies of Recrystallization of CdTe Thin Films After $CdCl_2$ Treatment. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic

Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/moutinho.pdf*

NCPV Preprints for the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. September 1998; 144 pp. Also available online at: *http://www.nrel.gov/ ncpv/wcpec.html*
Order no. TP-520-25101.

NREL Photovoltaic Program FY 1997 Annual Report. June 1998; 564 pp.
Order no. BK-210-23607.

Olsen, L.C. Alternative Window Schemes for $CuInSe_2$-Based Solar Cells: Annual Report, 1 November 1995-31 October 1996. October 1997; 29 pp. Work performed by Electronic Materials Laboratory, Richland, Washington.
Order no. SR-520-23590.

Olson, J.M.; McMahon, W.E. Structure of Ge(100) Surfaces for High-Efficiency Photovoltaic Applications. July 1998; 7 pp. Presented at the 2nd World Conference and Exhibition on Photovoltaic Solar Energy Conversion; 6-10, 1998; Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/strcture.pdf*

Osterwald, C.R.; Anevsky, S.; Barua, A.K.; Bucher, K.; Chaudhuri, P.; Dubard, J.; Emery, K.; King, D.; Hansen, B.; Metzdorf, J.; Nagamine, F.; Shimokawa, R.; Wang, Y.X.; Wittchen, T.; Zaaiman, W.; Zastrow, A.; Zhang, J. Results of the PEP'93 Intercomparison of Reference Cell Calibrations and Newer Technology Performance Measurements: Final Report. March 1998; 209 pp.
Order no. TP-520-23477.

Osterwald, C.R.; Anevsky, S.; Barua, A.K.; Chaudhuri, P.; Dubard, J.; Emery, K.; Hansen, B.; King, D.; Metzdorf, J.; Nagamine, F.; Shimokawa, R.; Wang, Y.X.; Wittchen, T.; Zaaiman, W.; Zastrow, A.; Zhang, J.
World Photovoltaic Scale: An International Reference Cell Calibration Program.
September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/ worldPhotovoltaic Specialists Conferenceale.pdf*

Perez, R.; Seals, R. Photovoltaics Effective Capacity; Interim Final Report 2. November 1997; 50 pp. Work performed by Atmospheric Sciences Research Center, University at Albany, Albany, New York.
Order no. SR-520-23097.

Pern, F.J.; Glick, S.H. Improved Photostability of NREL-Developed EVA Pottant Formulations for PV Module Encapsulation.
September 1997; 11 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at:
http://www.nrel.gov/ncpv/pdf/pern.pdf

Porter, D.G.; Meyer, H.; Leang, W. Three-Phase Power Conversion System for Utility Interconnected PV Applications: Phase I Technical Progress Report, 1 October 1995-17 April 1997. February 1998; 43 pp. Work performed by Omnion Power Engineering Corporation, East Troy, Wisconsin.
Order no. SR-520-24095.

Powell, R.C.; Dorer, G.L.; Jayamaha, U.; Hanak, J.J. Technology Support for Initiation of High-Throughput Processing of Thin-Film CdTe PV Modules: Phase III Final Technical Report, 14 March 1997-1 April 1998. September 1998; 85 pp. Work performed by Solar Cells, Inc., Toledo, Ohio.
Order no. SR-520-25422.

Ramanathan, K.; Bhattacharya, R.N.; Granata, J.; Webb, J.; Niles, D.; Contreras, M.; Wiesner, H.; Hasoon, F.; Noufi, R. Advances in the CIS Research at NREL. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at:
http://www.nrel.gov/ncpv/pdf/advances.pdf

Ramanathan, K.; Wiesner, H.; Bhattacharya, R.; Keane, J.; Webb, J.; Noufi, R. High-Efficiency $Cu(In,Ga)Se_2$ Thin Film Solar Cells Without Intermediate Buffer Layers. July 1998; 6 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at *http://www.nrel.gov/ncpv/pdf/higheff.pdf*

Rand, J.A.; Bai, Y.; Barnett, A.M.; Culik, J.S.; Ford, D.H.; Hall, R.B.; Kendall, C.L. Large-Area Silicon-Film™ Panels and Solar Cells: Final Technical Report, July 1995-March 1998. September 1998; 31 pp. Work performed by AstroPower Inc., Newark, Delaware.
Order no. SR-520-25270.

Rummel, S.; Emery, K.; Field, H.; Moriarty, T.; Anderberg, A.; Dunlavy, D.; Ottoson, L. PV Cell and Module Performance Measurement Capabilities at NREL. September 1998; 8 pp. Presented at the National Center for Photovoltaics Program Review Meeting, 8-11 September 1998, Denver, Colorado.
Order no. CP-520-25411.

Sandwisch, D.W. High-Throughput Manufacturing of Thin-Film CdS/CdTe Photovoltaic Modules: Annual Subcontract Report, 16 September 1996-15 January 1998. August 1998; 45 pp. Work performed by Solar Cells, Inc., Toledo, Ohio.
Order no. SR-520-25263.

Schulz, D.L.; Curtis, C.J.; Cram, A.; Alleman, J.L.; Mason, A.; Matson, R.J.; Perkins, J.D.; Ginley, D.S.
CIGS Films via Nanoparticle Spray Deposition: Attempts at Densifying a Porous Precursor. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at
http://www.nrel.gov/ncpv/pdf/CIGSfilms.pdf

Searson, P.C.; Meyer, G.J. Solar Energy Conversion at Dye Sensitized Nanostructured Electrodes Fabricated by Sol-Gel Processing: Final Report. July 1998; 28 pp. Work performed by Johns Hopkins University, Baltimore, Maryland.
Order no. SR-520-24521.

Sites, J.R. Device Physics of Thin-Film Polycrystalline Cells and Modules: Annual Subcontract Report, 6 December 1995-5 December 1996. October 1997; 36 pp. Worked performed by Colorado State University, Fort Collins, Colorado.
Order no. SR-520-23589.

Sopori, B.L., Chairman. Eighth Workshop on the Crystalline Silicon Solar Cell Materials and Processes: Extended Papers and Abstracts from the Workshop, 17-19 August 1998, Copper Mountain, Colorado. Golden, CO: National Renewable Energy Laboratory, 1998; 261 pp.
Order no. CP-520-25232.

Sopori, B.L.; Chen, W.; Gee, J.; Jones, K. On the Performance Limiting Behavior of Defect Clusters in Commercial Silicon Solar Cells. July 1998; 5 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria.
Order no. CP-520-23968. Available online only at *http:// www.nrel.gov/ncpv/pdf/sopori.pdf.*

Sopori, B.L.; Madjdpour, J.; Chen, W. Applications of "PV Optics" for Solar Cell and Module Design. July 1998; 5 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/apps.pdf*

Sopori, B.; Symko, M.I.; Reedy, R.; Jones, K.; Matson, R. Mechanism(s) of Hydrogen Diffusion in Silicon Solar Cells During Forming Gas Anneal. September 1997; 7 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/mechanisms.pdf*

Stone, J.L.; Ullal, H.S.; Sastry, E.V.R. Indo-U.S. Cooperative Photovoltaic Project. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/stone.pdf*

Stone, J.L.; Ullal, H.S.; Sherring, C. Ramakrishna Mission Economic PV Development Initiative. July 1998; 5 pp. 2nd World Conference on PV Solar Energy Conversion; 6-10 July 1998; Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/ramak.pdf*

Swanson, R.; Tan, T.; Sopori, B. Seventh Workshop on the Role of Impurities and Defects in Silicon Device Processing: Summary of the Panel Discussions, 11-13 August 1997, Vail, Colorado. October 1997; 15 pp.
Order no. CP-520-23549.

Tarrant, D.E.; Gay, R.R. CIS-Based Thin Film PV Technology: Phase 2 Technical Report, October 1996-October 1997. May 1998; 30 pp. Work performed by Siemens Solar Industries, Camarillo, California.
Order no. SR-520-24751.

Taylor, P.C.; Chen, D.; Chen, S.L.; Gaughan, K.; Gu, S.Q.; Hari, P.; Hershgold, S.; Mao, D.; Ohlsen, W.D.; Su, T.; Viner, J.M.; Xu, W.; Yan, B.; Williams, G.A. Electronic Processes in Thin-Film PV Materials: Final Report. July 1998; 146 pp. Work performed by University of Utah, Salt Lake City, Utah.
Order no. SR-520-24840.

Taylor, R. Lessons Learned from the NREL Village Power Program. July 1998; 5 pp. Presented at the 2nd World Conference and Exhibition on Photovoltaic Solar Energy Conversion; 6-10 July 1998; Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/lessons.pdf*

Thomas, H.P.; Kroposki, B.; McNutt, P.; Witt, C.E.; Bower, W.; Bonn, R.; Hund, T.D. Progress in Photovoltaic System and Component Improvements. August 1998; 8 pp. Prepared for the 2nd World Conference and Exhibition on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online at: *http://www.nrel.gov/ncpv/pdf/holly.pdf*

Trefny, J.U.; Mao, D. Polycrystalline Thin-Film Cadmium Telluride Solar Cells Fabricated by Electrodeposition: Annual Technical Report. January 1998; 37 pp. Work performed by Colorado School of Mines, Golden, Colorado.
Order no. SR-520-23994.

Tsuo, Y.S.; Gee, J.M.; Menna, P.; Strebkov, D.S.; Pinov, A.; Zadde, V. Environmentally Benign Silicon Solar Cell Manufacturing. July 1998; 7 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Work performed by National Renewable Energy Laboratory, Golden, Colorado; Sandia National Laboratories, Albuquerque, New Mexico; National Agency for New Technologies in Energy and Environment, Naples, Italy; and Intersolarcenter, Moscow, Russia. Available online only at: *http:// www.nrel.gov/ncpv/pdf/tsuo.pdf*

Ullal, H.S.; Zweibel, K.; von Roedern, B.G. Current Status of Polycrystalline Thin-Film PV Technologies. September 1997; 6 pp. Prepared for the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/huieeepv.pdf*

Vanecek, D.; Diver, M.; Fernandez, R. Photovoltaic Industry Manufacturing Technology Assessment, Final Report. August 1998; 32 pp. Work performed by Automation and Robotics Research Institute, Fort Worth, Texas.
Order no. SR-520-24823.

Venkatasubramanian, R. High-Efficiency GaAs Solar Cells on Polycrystalline Ge Substrates: Final Report. August 1998; 41 pp. Work performed by Research Triangle Institute, Research Triangle Park, North Carolina.
Order no. SR-590-24820.

Wallace, W.L.; Jingming, B.; Shangbin, G. Use of Photovoltaics for Rural Electrification in Western China. July 1998; 7 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/photo.pdf*

Wallace, W.L.; Tsuo, Y.S. Photovoltaics for Rural Electrification in the People's Republic of China. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaics Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/ieeewall.pdf*

Wang, Q.; Nelson, B.P.; Iwaniczko, E.; Mahan, A.H.; Crandall, R.S.; Benner, J. Influence of Charge Effect on the Growth of Hydrogenated Amorphous Silicon by the Hot-Wire Chemical Vapor Deposition Technique. July 1998; 5 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at *http://www.nrel.gov/ncpv/pdf/influenc.pdf*

Wang, T.H.; Ciszek, T.F. Numerical Simulations of Transient Photoconductance Decay. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/numerica.pdf*

Wangensteen, T.L.; Wanlass, M.W.; Carapella, J.J.; Moutinho, H.R.; Mason, A.R.; Webb, J.D.; Abulfotuh, F.A. Optical Characterization of Epitaxial $Ga_xIn_{1-x}As$ Suitable for Thermophotovoltaic (TPV) Converters. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/wangen.pdf*

Ward, J.S.; Duda, A.; Zweibel, K.; Coutts, T.J. Large-Area, High-Intensity PV Arrays for Systems Using Dish Concentrating Optics. July 1998; 6 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/large.pdf*

Waters, D.M.; Niles, D.W.; Gessert, T.A.; Sheldon, P. Surface Analysis of CdTe after Various Pre-Contact Treatments. July 1998; 5 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/surface.pdf*

Webb, J.D.; Rose, D.H.; Niles, D.W.; Swartzlander, A.; Al-Jassim, M.M. FTIR, EPMA, Auger, and XPS Analysis of Impurity Precipitates in CdS Films. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http://www.nrel.gov/ncpv/pdf/ieeewebb.pdf*

Whitaker, C.M.; Newmiller, J.D. Photovoltaic Module Energy Rating Procedure: Final Subcontract Report. January 1998; 126 pp. Work performed by Endecon Engineering, San Ramon, California.
Order no. SR-520-23942.

Witt, C.E.; Mitchell, R.L.; Thomas, H.P.; Symko, M.I.; King, R.; Ruby, D.S. Manufacturing Improvements in the Photovoltaic Manufacturing Technology (PVMaT) Project. August 1998; 7 pp. Presented at the 2nd World Conference and Exhibition on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at *http://www.nrel.gov/ncpv/pdf/manufac.pdf*

Wohlgemuth, J. Cast Polycrystalline Silicon Photovoltaic Module Manufacturing Technology Improvements: Annual Subcontract Report, 1 January 1996-31 December 1996. October 1997; 37 pp. Work performed by Solarex Corporation, Frederick, Maryland.
Order no. SR-520-23623.

Woods, L.M.; Levi, D.H.; Kaydanov, V.; Robinson, G.Y.; Ahrenkiel, R.K. Electrical Characterization of CdTe Grain-Boundary Properties from As Processed CdTe/CdS Solar Cells. July 1998; 5 pp. Prepared for presentation at the 2nd World Conference on Photovoltaic Solar Energy Conversion, 6-10 July 1998, Vienna, Austria. Available online only at: *http://www.nrel.gov/ncpv/pdf/electric.pdf*

Wronski, C.R.; Collins, R.W.; Burnham, J.S.; Chen, I.S.; Fujiwara, H.; Jiao, L.; Lee, Y.; Lu, Z.; Kim, S.; Ferlauto, A.; Koh, J.; Liu, H.; Niu, X.; Semoushkina, S. Wide Band Gap Solar Cells with High Stabilized Performance: Final Subcontract Report, 15 July-15 March 1998. August 1998; 164 pp. Work performed by Center for Thin Film Devices, Pennsylvania State University, University Park, Pennsylvania.
Order no. SR-520-25271.

Wu, X.; Sheldon, P.; Coutts, T.J.; Rose, D.H.; Moutinho, H.R. Application of Cd_2SnO_4 Transparent Conducting Oxides in CdS/CdTe Thin-Film Devices. September 1997; 5 pp. Presented at the 26th IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. Available online only at: *http:// www.nrel.gov/ncpv/pdf/applications.pdf*

Zweibel, K.; Moskowitz, P.; Fthenakis, V. Thin-Film Cadmium Telluride Photovoltaics: ES&H Issues, Solutions, and Perspectives. February 1998; 6 pp.
Order no. TP-520-24057.

Solar Energy—Thermal

Burch, J.; Thomas, K.E. Overview of Water Disinfection in Developing Countries and the Potential for Solar Thermal Water Pasteurization. January 1998; 114 pp.
Order no. TP-550-23110.

Kennedy, C.E.; Smilgys, R.V. Progress Toward Achieving a Commercially Viable Solar Reflective Material. June 1, 1998; 12 pp. Presented at the 11th International Vacuum Web Coating Conference, 9-11 November 1997, Miami, Florida.
Order no. CP-510-24058.

Transportation

Dodge, L.; Bourn, G.; Callahan, T.; Grogan, J.; Leone, D.; Naegeli, D.; Shouse, K.; Thring, R.; Whitney, K. Development of a Dedicated Ethanol Ultra-Low Emission Vehicle (ULEV): Final Report. September 1998; 119 pp. Work performed by Southwest Research Institute, San Antonio, Texas.
Order no. SR-540-24603.

Dodge, L.; Callahan, T.; Leone, D.; Naegeli, D.; Shouse, K.; Smith, L.; Whitney, K. Development of a Dedicated Ethanol Ultra-Low-Emissions Vehicle (ULEV): Phase 3 Report. April 1998; 109 pp. Work performed by Southwest Research Institute, San Antonio, Texas.
Order no. SR-540-24225.

Graham, R.P. Low-Cost Conformable Storage to Maximize Vehicle Range. January 1998; 75 pp. Work performed by Thiokol Aerospace & Industrial Technologies, Brigham City, Utah.
Order no. SR-540-23579.

A Guide to the Emissions Certification Procedures for Alternative Fuel Aftermarket Conversions. January 1998; 68 pp.
Order no. TP-540-22757.

Guthrie, P.; Ligocki, M.; Looker, R.; Cohen, J. Air Quality Effects of Alternative Fuels: Final Report. November 1997; 243 pp. Work performed by Systems Applications International, Inc., San Rafael, California.
Order no. SR-540-23896.

Hennepin County's Experience with Heavy-Duty Ethanol Vehicles. January 1998; 145 pp. Work performed by Trucking Research Instititute, Alexandria, Virginia, and Hennepin County Central Mobile Equipment Division, Hopkins, Minnesota.
Order no. SR-540-22726.

Hodgson, J.W.; Irick, D.K. Investigation and Demonstration of a Rich Combustor Cold-Start Device for Alcohol-Fueled Engines. April 1998; 88 pp. Work performed by University of Tennessee, Knoxville, Tennessee.
Order no. SR-540-23864.

Kubesh, J.T. Development of an Ultra-Safe, Ultra-Low Emissions Natural-Gas Fueled School Bus: Final Report. March 1998; 51 pp. Work performed by Southwest Research Institute, San Antonio, Texas.
Order no. SR-540-23842.

Markel, A.J.; Bailey, B.K. Modeling and Cold Start in Alcohol-Fueled Engines. May 1998; 62 pp.
Order no. TP-540-24180.

Partial Oxidation for Improved Cold Starts in Alcohol-Fueled Engines: Phase II Topical Report. April 1998; 36 pp. Work performed by Arthur D. Little, Inc., Cambridge, Massachusetts.
Order no. SR-540-23863.

Peerenboom, W. Demonstrating and Evaluating Heavy-Duty Alternative Fuel Operations. February 1998; 36 pp. Work performed by Trucking Research Institute, Alexandria, Virginia.
Order no. SR-540-23843.

Pesaran, A.; Burch, S.; Rehn, R.; Swan, D.; Guerin, J.T.; Olson, J.; Skellenger, G. Thermal Analysis and Performance of a Battery Pack for a Hybrid Electric Vehicle. June 1998; 13 pp. Prepared for the 15th Electric Vehicle Symposium (EVS-15), 29 September-1 October 1998, Brussels, Belgium.
Order no. CP-540-24844.

Pesaran, A.A.; Rehn, R.; Russell, D.J.; Crawford, J.W.; Lewis, E.A. Unique Calorimeter-Cycler for Evaluating High-Power Battery Modules. December 1997; 7 pp. Prepared for the 13th Annual Battery Conference on Applications and Advances, 13-16 January 1998, Long Beach, California.
Order no. CP-540-23799.

Pesaran, A.A.; Vlahinos, A.; Burch, S.D. Thermal Performance of EV and HEV Battery Modules and Packs. September 1997; 13 pp. Prepared for the 14th International Electric Vehicle Symposium, 12-17 December 1997, Orlando, Florida.
Order no. CP-540-23527.

Sheehan, J.; Camobreco, V.; Duffield, J.; Graboski, M.; Shapouri. H. Life Cycle Inventory of Biodiesel and Petroleum Diesel for Use in an Urban Bus: Final Report. May 1998; 314 pp.
Order no. SR-580-24089.

Sidhu, S.; Graham, J.; Taylor, P.; Dellinger, B. Origin of Organic Pollutants from the Combustion of Alternative Fuels: Phase V/VI Report. May 1998; 54 pp. Work performed by University of Dayton Research Institute, Dayton, Ohio.
Order no. SR-540-24134.

Urban Airshed Modeling of Air Quality Impacts of Alternative Transportation Fuel Use in Los Angeles and Atlanta. December 1997; 135pp. Work performed by Earth Technology, Inc., Concord, Massachusetts.
Order no. SR-540-23960.

Whitney, K.A. Determination of Alternative Fuels Combustion Products: Phase 3 Report. December 1997; 90 pp. Work performed by Southwest Research Institute, San Antonio, Texas.
Order no. SR-540-23594.

Utilities

Rothstein, S.M.; Fang, J.M. Green Marketing in the Massachusetts Electric Company Retail Competition Pilot Program. Topical Issues Brief. October 1997; 23 pp.
Order no. TP-260-23507.

Sweezey, B.; Houston, A. Information Brief on Green Power Marketing, 2nd Edition. February 1998; 26 pp. Available online at: *http://www.eren.doe.gov/greenpower/market_brief_2/*
Order no. TP-210-23881.

Wind Energy

Bialasiewicz, J.T.; Muljadi, E.; Drouilhet, S.; Nix, G. Modular Simulation of a Hybrid Power System with Diesel and Wind Turbine Generation. June 1998; 12 pp. December 1998. Available online at: *http://www.nrel.gov/wind/CP-500-24681.pdf*
Order no. CP-500-24681.

Buhl, M.L.; Wright, A.D.; Tangler, J.L. Wind Turbine Design Codes: A Preliminary Comparison of the Aerodynamics. December 1997; 11 pp. Prepared for the 17th ASME Wind Energy Symposium, 12-15 January 1998, Reno, Nevada.
Order no. CP-500-23975.

Calvert, S.; Goldman, P.; DeMeo, E.; McGowin, C.; Smith, B.; Tromly, K. EPRI/DOE Wind Turbine Performance Verification Program. January 1997; 6 pp. Presented at Solar Energy Forum, 25-30 April 1997, Washington, D.C. Available online at: *http://www.nrel.gov/wind/CP-440-22486.pdf*
Order no. CP-440-22486.

Elliott, D.; Chadraa, B.; Natsagdorj, L. Mongolia Wind Resource Assessment Project. September 1998; 8 pp. 1998.
Order no. CP-500-25148.

Elliott, D.L.; Schwartz, M. Validation of Regional Wind Resource Predictions in the Northern Great Plains. August 1998; 11 pp. December 1998.
Order no. CP-500-25069.

Fingersh, L.J.; Carlin, P.W. Results from the NREL Variable-Speed Test Bed. November 1997; 7 pp. Prepared for the ASME 17th Wind Energy Symposium, 12-15 January 1998, Reno, Nevada.
Order no. CP-500-23811.

Fingersh, L.J.; Robinson, M.C. Effects of Variable-Speed and Drive Train Component Efficiencies on Wind Turbine Energy Capture. May 1998; 9 pp. Presented at ASME/AIAA Wind Energy Symposium, 6-9 January 1997, Reno, Nevada.
Order no. CP-500-22082.

Fingersh, L.J.; Robinson, M.J. Wind Tunnel Calibration of 5-Hole Pressure Probes for Application to Wind Turbines. May 1998; 8 pp. Presented at ASME/AIAA Wind Energy Symposium, 6-9 January 1997, Reno, Nevada.
Order no. CP-500-22134.

Flowers, L. Lessons Learned—NREL Village Power Program. July 1998; 6 pp. December 1998. Available online at: http://www.nrel.gov/wind/CP-500-24938.pdf
Order no. CP-500-24938.

Gevorgian, V.; Corbus, D.A.; Drouilhet, S.; Holz, R.; Thomas, K.E. Modeling, Testing and Economic Analysis of Wind-Electric Battery Charging Station. July 1998; 12 pp. December 1998. Available online at: *http://www.nrel.gov/wind/CP-500-24920.pdf*
Order no. CP-500-24920.

Hand, M.M.; Balas, M.J. Systematic Approach for PID Controller Design for Pitch-Regulated, Variable-Speed Wind Turbines. November 1997; 13 pp. Prepared for the 17th ASME Wind Energy Symposium, 12-15 January 1998, Reno, Nevada.
Order no. CP-440-23539.

Harmata, A.; Podruzny, K.; Zelenak, J. Avian Use of Norris Hill Wind Resource Area, Montana. July 1998; 120 pp. Work performed by Montana State University, Bozeman, Montana.
Order no. SR-500-23822.

Holz, R.; Drouilhet, S.; Gervorgian, V. Wind-Electric Ice-Making Investigation. July 1998; 11 pp. December 1998. Available online at: *http://www.nrel.gov/wind/CP-500-24662.pdf*
Order no. CP-500-24662.

Holz, R.; Gervorgian, V.; Drouilhet, S.; Muljadi, E. Wind-Electric Icemaking Project: Analysis and Dynamometer Testing, Volumes I and II. July 1998; 255 pp.
Order no. TP-500-24010.

Kelley, N.; Wright, A.; Bir, G.; Osgood, R.; McKenna, E.; Sutherland, H. Overview of the NREL/SNL Flexible Turbine Characterization Project. September 1998; 12 pp. Presented at the 17th ASME/AIAA Wind Energy Symposium, 12-15 January 1998, Reno, Nevada.
Order no. CP-500-24046.

Kline, J.; Milligan, M. Evaluation of Hourly Average Wind-Speed Estimation Techniques. May 1998; 12 pp. December 1998. Available online at: *http://www.nrel.gov/wind/CP-500-24664.pdf*
Order no. CP-500-24664.

Larwood, S.M. Dynamic Characterization of the AWT-26 Turbine for Variable-Speed Operation. July 1998; 20 pp. Available online at: *http://www.nrel.gov/wind/TP-500-24919.pdf*
Order no. TP-500-24919.

McNiff, B.; LaWhite, N.; Muljadi, E. Characterizing Wind Turbine System Response to Lightning Activity. July 1998; 15 pp. December 1998.
Order no. CP-500-24790.

Miller, L.S.; Quandt, G.A.; Huang, S. Atmospheric Tests of Trailing-Edge Aerodynamic Devices. January 1998; 45 pp. Work performed by Wichita State University, Wichita, Kansas, and Wind Turbine Engineering Consultant, Seattle, Washington.
Order no. SR-500-22350.

Milligan, M.R.; Artig, R. Optimal Site Selection and Sizing of Distributed Utility-Scale Wind Power Plants. April 1998; 12 pp. Prepared for International Association of Energy Economists, 21st Annual International Conference, Quebec City, Quebec, Canada, May 13-16, 1998. Available online at: *http://www.nrel.gov/wind/CP-500-24312.pdf*
Order no. CP-500-24312.

Milligan, M.R.; Artig, R. Reliability Benefits of Dispersed Wind Resource Development. May 1998; 12 pp. December 1998. Available online at: *http://www.nrel.gov/wind/CP-500-24314.pdf*
Order no. CP-500-24314.

Morrison, M.L.; Pollock, K.H. Development of a Practical Modeling Framework for Estimating the Impact of Wind Technology on Bird Populations. November 1997; 42 pp. Work performed by California State University, Sacramento, California, and North Carolina State University, Raleigh, North Carolina.
Order no. SR-440-23088.

Muljadi, E.; Butterfield, C.P.; Wan, Y.H. Axial Flux, Modular, Permanent-Magnet Generator with a Toroidal Winding for Wind Turbine Applications. July 1998; 5 pp. Prepared for the IEEE Industry Applications Conference, 5-8 November 1998, St. Louis, Missouri. Available online at: *http://www.nrel.gov/wind/CP-500-24996.pdf*
Order no. CP-500-24996.

Muljadi, E.; Forsyth, T.; Butterfield, C.P. Soft-Stall Control versus Furling Control for Small Wind Turbine Power Regulation. July 1998; 12 pp. December 1998.
Order no. CP-500-25100.

Muljadi, E.; Pierce, K.; Migliore, P. Control Strategy for Variable-Speed, Stall-Regulated Wind Turbines. April 1998; 7 pp. Presented at American Controls Conference, 24-26 June 1998, Philadelphia, Pennsylvania. Available online at: *http://www.nrel.gov/wind/CP-500-24311.pdf*
Order no. CP-500-24311.

Olsen, T.L.; McKenna, E. Wind Resource Assessment and Wind Energy System Cost Analysis: Fort Huachuca, Arizona. December 1997; 38 pp.
Order no. SR-500-21121.

Pierce, K.; Fingersh, L.J. Wind Turbine Control System Modeling Capabilities. April 1998; 7 pp. Prepared for the American Controls Conference, 24-26 June 1998, Philadelphia, Pennsylvania.
Order no. CP-500-24378.

Schwartz, M.N.; Bailey, B.H. Wind Forecasting Objectives for Utility Schedulers and Energy Traders. May 1998; 7 pp. December 1998. Available online at: *http://www.nrel.gov/wind/CP-500-24680.pdf*
Order no. CP-500-24680.

Stern, M.; Duran, G.; Fourer, G.; Mackamul, K.; Whalen, W.; Van Loo, M.; West, R. Development of a Low-Cost Integrated 20 kW-AC Solar Tracking Subarray for Grid-Connected PV Power System Applications: Final Technical Report. June 1998; 45 pp. Work performed by Utility Power Group, Chatsworth, California.
Order no. SR-520-24759.

Wan, Y.H.; Green, H.J. Current Experience with Net Metering Programs. May 1998; 12 pp. December 1998. Available online at: *http://www.nrel.gov/wind/CP-500-24527.pdf*
Order no. CP-500-24527.

Zaininger, H.W. Integrating Wind Turbines into the Orcas Island Distribution System. September 1998; 70 pp. Work performed by Zaininger Engineering Company, Roseville, California.
Order no. SR-500-24792.

Conference Papers/ Journal Articles/ Book Chapters

This section includes NREL documents that can be found in conference proceedings, journals, and books. These documents communicate findings from NREL research and analysis to other technical professionals. The documents in this section are available through your local library.

Alternative Fuels

Bajpai, R.; Glassner, D.A. Bioprocessing Research. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: p. 415.

Baker, J.O.; Ehrman, C.I.; Adney, W.S.; Thomas, S.R.; Himmel, M.E. Hydrolysis of Cellulose Using Ternary Mixtures of Purified Cellulases. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 395-403.

Baker, J.O.; Vinzant, T.B.; Ehrman, C.I.; Adney, W.S.; Himmel, M.E. Use of a New Membrane-Reactor Saccharification Assay to Evaluate the Performance of Cellulases Under Simulated SSF Conditions. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: pp. 585-595.

Chen, R.; Wu, Z.; Lee, Y.Y. Shrinking-Bed Model for Percolation Process Applied to Dilute-Acid Pretreatment/ Hydrolysis of Cellulosic Biomass. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 37-49.

Costello, R.; Hinman, N.; Neufeld, S. Resources to Support Commercialization and Use of Bioethanol. Overend, R.P.; Chornet. E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; Vol. 2: pp. 1133-1140.

Davison, B.H.; Finkelstein, M.; Wyman, C.E., eds. Biotechnology for Fuels and Chemicals: Proceedings of the Eighteenth Symposium, 5-9 May 1996, Gatlinburg, Tennessee. *Applied Biochemistry and Biotechnology.* Totowa, NJ: Humana Press, Spring 1997; Vols. 63-65: 903 pp.

Davison, B.H.; Finkelstein, M.; Wyman, C.E. Introduction to the Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: pp. iii-vi.

Dorsch, R.R.; Hatzis, C. Introduction to Session 3: Bioprocessing Research. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: p. 349.

Elander, R.; Ibsen, K.; Hayward, T.; Nagle, N.; Torget, R. Overall Process Considerations for Using Dilute Acid Cellulose Hydrolysis Technology to Produce Ethanol from Biomass. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; Vol. 2: pp. 1025-1034.

Finkelstein, M.; Davison, B.H. Proceedings Introduction. Applied Biochemistry and Biotechnology: *Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. iii-vii.

Graham, R.L.; Allison, L.J.; Becker, D.A. ORECCL-Oak Ridge Energy Crop County Level Database. *Bioenergy '96 —Partnerships to Develop and Apply Biomass Technologies. Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee.* Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. I: pp. 522-529. Work performed by Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Himmel, M.E.; Adney, W.S.; Baker, J.O.; Elander, R.; McMillan, J.D.; Nieves, R.A.; Sheehan, J.J.; Thomas, S.R.; Vinzant, T.B.; Zhang, M. Advanced Bioethanol Production Technologies: A Perspective. Saha, B.C.; Woodward, J., eds. *Fuels and Chemicals from Biomass: ACS Symposium Series 666.* Washington, DC: American Chemical Society, 1997; Chap. 1: pp. 2-45. Developed from a symposium sponsored by the Division of Biochemical Technology at the 211th National Meeting of the American Chemical Society, 24-29 March, 1996, New Orleans, Louisiana.

Himmel, M.E.; Karplus, P.A.; Sakon, J.; Adney, W.S.; Baker, J.O.; Thomas, S.R. Polysaccharide Hydrolase Folds: Diversity of Structure and Convergence of Function. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: pp. 315-325.

Hinman, N.D. Biofuels (White paper). McIntyre, M., ed. *Solar Energy: Today's Technologies for a Sustainable Future.* Boulder, CO: American Solar Energy Society, August 1997; Chap. 4: pp. 49-51.

Hinman, N.D.; Yancey, M.A Net Present Value Analysis to Select Public R&D Programs and Valuate Expected Private Sector Participation. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: pp. 599-607.

Holtzapple, M.T.; Torget, R. Introduction to Session 1: Thermal, Chemical, and Biological Processing. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: pp. 1-2.

Jeffries, T.; Himmel, M. Applied Biological Research. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals,* 4-8 May 1997, Colorado Springs, Colorado. Spring 1998; Vols. 70-72: pp. 113-114.

Johnson, R.C.; Srinivasan, N.; Cooks, R.G.; Schell, D. Membrane Introduction Mass Spectrometry in a Pilot Plant: On-line Monitoring of Fermentation Broths. *Rapid Communication in Mass Spectrometry.* 1997; 11(4): pp. 363-367.

Kadam, K.L.; Hsu, T.A High-Solids Process for the Pretreatment of Lignocellulosic Feedstock in Bioethanol Production. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; Vol. 2: pp. 1079-1089.

Kadam, K.L.; Schmidt, S.L. Evaluation of *Candida acidothermophilum* in Ethanol Production from Lignocellulosic Biomass. *Applied Microbiology Biotechnology.* 1997; 48(6): pp. 709-713.

Keller, F.A.; Bates, D.; Ruiz, R.; Nguyen, Q. Yeast Adaptation on Softwood Prehydrolysate. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 137-148.

Keller, F.; Danninger, K. Improved Mixing of High Biomass Concentrations by Double Helical Impeller. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; Vol. 2: p. 1239.

Kelley, S.S.; Wang, X.M.; Myers, M.D.; Johnson, D.K.; Scahill, J.W. Use of Biomass Pyrolysis Oils for Preparation of Modified Phenol Formaldehyde Resins. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion.* London: Blackie Academic & Professional, 1997; Vol. I: pp. 557-572.

Lawford, H.G.; Rousseau, J.D.; McMillan, J.D. Optimization of Seed Production for a Simultaneous Saccharification Cofermentation Biomass-to-Ethanol Process using Recombinant Zymomonas. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; 63-65: pp. 269-286.

Lawford, H.G.; Rousseau, J.D.; Mohagheghi, A.; McMillan, J.D. Continuous Culture Studies of Xylose-Fermenting *Zymomonas mobilis*. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 353-367.

Lusk, P.E. Deploying Anaerobic Digesters: Current Status and Future Possibilities. *Energy Business Technology Sourcebook: Proceedings of the 19th World Energy Engineering Congress, 6-8 November 1996, Atlanta, Georgia.* 1997; Chap. 3: pp. 21-26. Work performed by Lusk Resource Development Associates.

Lynd, L.; Dale, B.; Delucchi, M.; Wyman, C. Biomass Processing in the Twenty-First Century. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; Vol. 2: p. 1091.

McLaughlin, S.B.; Samson, R.; Bransby, D.; Wiselogel, A. Evaluating Physical, Chemical, and Energetic Properties of Perennial Grasses as Biofuels. *Bioenergy '96—Partnerships to Develop and Apply Biomass Technologies. Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee.* Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. I: pp. 1-8.

Mohagheghi, A.; Evans, K.; Finkelstein, M.; Zhang, M. Cofermentation of Glucose, Xylose, and Arabinose by Mixed Cultures of Two Genetically Engineered *Zymomonas mobilis* Strains. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 285-299.

Nguyen, Q.A.; Tucker, M.P.; Boynton, B.L.; Keller, F.A.; Schell, D.J. Dilute Acid Pretreatment of Softwoods: Scientific Note. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 77-87.

Nieves, R.A.; Ehrman, C.I.; Adney, W.S.; Elander, R.T.; Himmel, M.E. Technical Communication: Survey and Analysis of Commercial Cellulase Preparations Suitable for Biomass Conversion to Ethanol. *World Journal of Microbiology and Biotechnology.* 1998; 14(2): pp. 301-304.

Overend, R.; Moon, S. Biomass (White paper). McIntyre, M., ed. *Solar Energy: Today's Technologies for a Sustainable Future.* Boulder, CO: American Solar Energy Society, August 1997; Chap. 2: pp. 30-33.

Philippidis, G.P.; Hatzis, C. Biochemical Engineering Analysis of Critical Process Factors in the Biomass-to-Ethanol Technology. *Biotechnology Progress.* 1997; 13(3): pp. 222-231.

Ranatunga, T.D.; Jervis, J.; Helm, R.F.; McMillan, J.D.; Hatzis, C. Toxicity of Hardwood Extractives Toward *Saccharomyces cerevisiae* Glucose Fermentation. *Biotechnology Letters.* November 1997; 19(11): pp. 1125-1127.

Ranatunga, T.D.; Jervis, J.; Helm, R.F.; McMillan, J.D.; Hatzis, C. Identification of Inhibitory Components Toxic Toward *Zymomonas mobilis* $CP_4(pZB_5)$ Xylose Fermentation. *Applied Biochemistry and Biotechnology:* 1997; 67(3): pp. 185-198.

Rivard, C.J.; Duff, B.W.; Dickow, J.H.; Wiles, C.C.; Nagle, N.J.; Gaddy, J.L.; Clausen, E.C. Demonstration-Scale Evaluation of a Novel High-Solids Anaerobic Digestion Process for Converting Organic Wastes to Fuel Gas and Compost. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 687-695.

Rivard, C.J.; Duff, B.W.; Nagle, N.J. Development of a Novel, Two-Step Process for Treating Municipal Biosolids for Beneficial Reuse. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 569-577.

Schell, D.; Nguyen, Q.; Tucker, M.; Boynton, B. Pretreatment of Softwood by Acid-Catalyzed Steam Explosion Followed by Alkali Extraction. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 17-24.

Schmidt, S.L.; Myers, M.D.; Kelley, S.S.; McMillan, J.D.; Padukone, N. Evaluation of PTMSP Membranes in Achieving Enhanced Ethanol Removal from Fermentations by Pervaporation. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: pp. 469-482.

Thompson, D.N.; Hames, B.R.; Reddy, C.A.; Grethlein, H.E. In Vitro Degradation of Insoluble Lignin in Aqueous Media by Lignin Peroxidase and Manganese Peroxidase. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 967-982.

Toon, S.T.; Philippidis, G.P.; Ho, N.W.Y.; Chen, Z.D.; Brainard, A.; Lumpkin, R.E.; Riley, C.J. Enhanced Cofermentation of Glucose and Xylose by Recombinant Saccharomyces Yeast Strains in Batch and Continuous Operating Modes. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: pp. 243-255.

Tucker, M.P.; Farmer, J.D.; Keller, F.A.; Schell, D.J.; Nguyen, Q.A. Comparison of Yellow Poplar Pretreatment Between the NREL Digester and Sunds Hydrolyzer. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 25-35.

Weil, J.; Brewer, M.; Hendrickson, R.; Sarikaya, A.; Ladisch, M.R. Continuous pH Monitoring During Pretreatment of Yellow Poplar Wood Sawdust by Pressure Cooking in Water. *Applied Biochemistry and Biotechnology: Proceedings of the Nineteenth Symposium on Biotechnology for Fuels and Chemicals, 4-8 May 1997, Colorado Springs, Colorado.* Spring 1998; Vols. 70-72: pp. 99-111.

Wiselogel, A.E.; Volkin, P.; Haase, S.; Whittier, J.; Dettmann, R. Front Range Forest Health Partnership Biomass-to-Ethanol Feasibility Study. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; Vol. 1: pp. 47-54.

Wyman, C.E. Progress in the United States on Development of Technology for Producing Ethanol from Lignocellulosic Biomass. Stumborg, M.A., ed. *Proceedings of the 1997 Ethanol Research and Development Workshop.* Ottawa, Canada: Natural Resources Canada, 1997; pp. 1-4.

Wyman, C.E. Progress on Ethanol Production from Lignocellulosic Biomass. Chartier, P.; Ferrero, G.L.; Henius, U.M., et al., eds. *Biomass for Energy and the Environment: Proceedings of the 9th European Bioenergy Conference, 24-27 June 1996, Copenhagen, Denmark.* Oxford, UK: Pergamon Press, 1997; Vol. 1: pp. 356-361.

Xiong, X.; Adney, W.S.; Vinzant, T.B.; Chou, Y.C.; Himmel, M.E.; Thomas, S.R. Expression of *Microbispora bispora* Bgl B-D-Glucosidase in *Streptomyces lividans*. Saha, B.C.; Woodward, J., eds. *Fuels and Chemicals from Biomass. ACS Symposium Series 666.* Washington, DC: American Chemical Society, 1997; Chap. 9: pp. 154-171. Developed from a symposium sponsored by the Division of Biochemical Technology at the 211th National Meeting of the American Chemical Society, 24-29 March, 1996, New Orleans, Louisiana.

Zhang, M.; Finkelstein, M. New Microorganisms for Ethanol Production: An Overview. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; Vol. 2: p. 1055.

Basic Sciences

Bhattacharya, R.N.; Hasoon, F.; Wiesner, H.; Ramanathan, K.; Field, H.; Matson, R.J.; Keane, J.; Swartzlander, A.; Mason, A.; Noufi, R.N. 13.6% Efficient $CuIn_{1-x}Ga_xSe$-Based Device from Electrodeposited Precursor. McBreen, J.; Mukerjee, S.; Srinivasan, S., eds. *Proceedings of the Electrochemical Society Symposium on Electrode Materials and Processes for Energy Conversion and Storage IV.* Pennington, NJ: The Electrochemical Society, Inc., 1997; Vol. 97-13: pp. 298-305.

Dillon, A.C.; Bekkedahl, T.A.; Jones, K.M.; Heben, M.J. Oxidative Opening and Filling by Hydrogen of Single-Wall Carbon Nanotubes. Kadish, K.M.; Ruoff, R.S., eds. *Proceedings of the Symposium on Recent Advances in the Chemistry and Physics of Fullerenes and Related Materials, 5-10 May 1996, Los Angeles, California. Electrochemical Society Proceedings Volume 96-10.* Pennington, NJ: The Electrochemical Society, Inc., 1996; Vol. 3: pp. 716-727.

Dubois, D.L. Development of Transition Metal Phosphine Complexes as Electrocatalysts for CO_2 and CO Reduction. *Comments on Inorganic Chemistry.* 1997; 19(5): pp. 307-325.

Ellingson, R.J.; Asbury, J.B.; Ferrere, S.; Ghosh, H.N.; Sprague, J.R.; Lian, T.; Nozik, A.J. Dynamics of Electron Injection in Nanocrystalline Titanium Dioxide Films Sensitized with [Ru(4,4'- Dicarboxy-2, 2'-Bipyridine)$_2$(NCS)$_2$] by Infrared Transient Absorption. *Journal of Physical Chemistry B.* 1998; 102(34): pp. 6455-6458.

Ginley, D.S.; Doughty, D.H.; Scrosati, B.; Takamura, T.; Zhang, Z., eds. Materials for Electrochemical Energy Storage and Conversion II—Batteries, Capacitors and Fuel Cells: Proceedings of the Materials Research Society Symposium, *1-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 496: 679+ pp.

Halley, J.W.; Walbran, S.; Smith, B.B. Molecular Dynamics Calculation of the Cuprous-Cupric Electron Transfer Rate at a Copper Electrode. Kornyshev, A.A.; Tosi, M.; Ulstrup, J., eds. *Theoretical Physics for Reaction Kinetics: Proceedings of the Conference on Electron and Ion Transfer in Condensed Media, 15-19 July 1996, Trieste, Italy.* Singapore: International Atomic Energy Agency, 1997; pp. 212-227.

Heben, M.J.; Bekkedahl, T.A.; Schulz, D.L.; Jones, K.M.; Dillon, A.C.; Curtis, C.J.; Bingham, C.; Pitts, J.R.; Lewandowski, A.; Fields, C.L. Production of Single-Wall Carbon Nanotubes Using Concentrated Sunlight. Kadish, K.M.; Ruoff, R.S., eds. *Proceedings of the Symposium on Recent Advances in the Chemistry and Physics of Fullerenes and Related Materials, 5-10 May 1996, Los Angeles, California. Electrochemical Society Proceedings, Volume 96-10.* Pennington, NJ: The Electrochemical Society, Inc., 1996; Vol. 3: pp. 803-811.

Khaselev, O.; Turner, J.A. Monolithic Photovoltaic-Photoelectrochemical Device for Hydrogen Production via Water Splitting. *Science.* 17 April 1998; 280: pp. 425-427.

Lampert, C.M.; Granqvist, C.G.; Gratzel, M.; Deb, S.K., eds. Optical Materials Technology for Energy Efficiency and Solar Energy Conversion XV: Proceedings of the SPIE Annual Meeting, 28-29 July 1997, San Diego, California. *SPIE Proceedings, Vol. 3138.* Bellingham, WA: Society of Photo-Optical Instrumentation Engineers, 1997; 235 pp.

McGraw, J.M.; Perkins, J.D.; Zhang, J.G.; Parilla, P.A.; Ciszek, T.F.; Fu, M.L.; Trickett, D.M.; Turner, J.A.; Ginley, D.S. Structural Phase Transformations in V_2O_5 Thin Film Cathode Material for Li Rechargeable Batteries. Ginley, D.S., et al., eds. *Materials for Electrochemical Energy Storage and Conversion II—Batteries, Capacitors and Fuel Cells: Proceedings of the Materials Research Society Symposium, 1-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 496: pp. 373-378.

Miedaner, A.; Noll, B.C.; DuBois, D.L. Synthesis and Characterization of Palladium and Nickel Complexes with Positively Charged Triphosphine Ligands and Their Use as Electrochemical CO_2-Reduction Catalysts. *Organometallics.* December 1997; 16: pp. 5779-5791.

Zaban, A.; Meier, A.; Gregg, B.A. Electric Potential Distribution and Short-Range Screening in Nanoporous TiO_2 Electrodes. *Journal of Physical Chemistry B.* 2 October 1997; 101(40): pp. 7985-7990.

Zhang, J.; Liu, P.; McGraw, J.M.; Turner, J.A.; Tracy, C.E.; Ginley, D.; Benson, D.K. Vanadium Oxide Thin-Film Cathodes for Lithium Rechargeable Battery Applications. *Journal of Dalian University of Technology.* April 1998; 38, S 1: pp. S19-S25.

Biomass Power

Abatzoglou, N.; Fernandez, J.C.; Laramee, L.; Jollez, P.; Chornet, E. Application of Gasification to the Conversion of Wood, Urban and Industrial Wastes. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion.* London: Blackie Academic & Professional, 1997; Vol. II: pp. 960-972.

Abatzoglou, N.; Legast, P.; Delvaux, P.; Bangala, D.; Chornet, E. Gas Conditioning Technologies for Biomass and Waste Gasification. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; Vol. 1: pp. 599-606.

Agblevor, F.A.; Besler-Guran, S.; Montane, D.; Wiselogel, A. Biomass Feedstock Variability and its Effect on Biocrude Oil Properties. Bridgewater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion.* London: Blackie Academic & Professional, 1997; Vol. I: pp. 741-755.

Agblevor, F.A.; Deutch, S.P.; Ehrman, C.; Ruiz, R. Overview of Development of Standard Analytical Procedures for Biomass Feedstocks. Bridgewater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion.* London: Blackie Academic & Professional, 1997; Vol. 1: pp. 723-730.

Bain, R.L.; Craig, K.R.; Overend, R.P. United States Department of Energy Biomass Power Demonstration Programs. *Energy Business Technology Sourcebook: Proceedings of the 19th World Energy Engineering Congress, 6-8 November 1996, Atlanta, Georgia.* 1997; Chap. 2: pp. 11-19.

Bangala, D.N.; Abatzoglou, N.; Martin, J.P.; Chornet, E. Catalytic Gas Conditioning: Application to Biomass and Waste Gasification. *Industrial and Engineering Chemistry Research.* 1997; Vol. 36: pp. 4184-4192.

Baxter, L.L.; Blander, M.; Dayton, D.; Milne, T.A. Thermochemical Equilibrium as an Indicator of Ash Deposition Problems in Biomass Boilers. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion.* London: Blackie Academic & Professional, 1997; Vol. II: pp. 1278-1292.

Baxter, L.L.; Miles, T.R.; Miles, T.R., Jr.; Jenkins, B.M.; Milne, T.A.; Dayton, D.; Bryers, R.W.; Oden, L.L. Behavior of Inorganic Material in Biomass-Fired Power Boilers: An Overview of the Alkali Deposits Project. Bridgewater, A.V.; Boocock, D.G.B., eds.

Developments in Thermochemical Biomass Conversion. London: Blackie Academic & Professional, 1997; Vol. II: pp. 1424-1444.

Beckman, D.; Solantausta, Y.; Koljonen, T.; Podesser, E.; Overend, R. Site Specific Analysis of Advanced Biomass Power Systems. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; Vol. 2: p. 1603.

Colucci-Raeos, J.A.; Saliceti-Piazza, L.; Hernandez, A.; Jackson, N.; Chornet, E.; Llompart, R.; Zerbi, N.; Gautier, P. Production of Energy and High-Value Chemicals from Municipal Solid Waste. *Bioenergy '96—Partnerships to Develop and Apply Biomass Technologies: Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee*. Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. II: pp. 778-784.

Craig, K.R.; Reed, M. Results and Implications of Eleven Site Specific Biomass Feasibility Studies. *Bioenergy '96—Partnerships to Develop and Apply Biomass Technologies: Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee*. Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. I: pp. 24-29.

Czernik, S.; Elam, C.C.; Evans, R.J.; Meglen, R.R.; Moens, L.; Tatsumoto, K. Catalytic Pyrolysis of Nylon-6 to Recover Caprolactam. *Journal of Analytical and Applied Pyrolysis*. June 1998; 46(1): pp. 51-64.

Czernik, S.; Wang, D.; Chornet, E. Production of Hydrogen from Biomass by Catalytic Steam Reforming of Fast Pyrolysis Oil. *Proceedings of the 1998 U.S. DOE Hydrogen Program Review, 28-30 April 1998, Alexandria, Virginia*. NREL/CP-570-25315. Golden, CO: National Renewable Energy Laboratory, 1998; Vol. II: pp. 557-576.

Czernik, S.; Wang, D.; Montane, D.; Chornet, E. Catalytic Steam Reforming of Biomass-Derived Fractions from Pyrolysis Processes. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion*. London: Blackie Academic & Professional, 1997; Vol. I: pp. 672-686.

Davison, B.H.; Barton, J.W.; Petersen, G.R. Nomenclature and Methodology for Classification of Nontraditional Biocatalysis. *Biotechnology Progress*. 1997; 13(5): pp. 512-518.

Dayton, D.C. Fate of Alkali Metal During Biomass Thermochemical Conversion. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion*. London: Blackie Academic & Professional, 1997; Vol. II: pp. 1263-1277.

Dayton, D.C.; Evans, R.J. Laboratory Gasification Studies via Partial Oxidation of Biomass Pyrolysis Vapors. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; Vol. 1: pp. 673-682.

Demeter, C.P.; Gray, E.E.; Lindsey, C.A. Global Repowering Opportunities for Biomass. *Bioenergy '96—Partnerships to Develop and Apply Biomass Technologies: Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee*. Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. I: pp. 179-186. Work performed by Antares Group, Inc., Landover, Maryland.

Diebold, J.P.; Czernik, S. Additives to Lower and Stabilize the Viscosity of Pyrolysis Oils during Storage. *Energy & Fuels*. September/October 1997; 11(5): pp. 1081-1091.

Diebold, J.P.; Scahill, J.W. Improvements in the Vortex Reactor Design. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion*. London: Blackie Acedemic & Professional, 1997; Vol. I: pp. 242-252.

Downing, M.; Bain, R.; Overend, R. Economic Development through Biomass Systems Integration: U.S. Energy Department Feasibility Studies. *Bioenergy '96—Partnerships to Develop and Apply Biomass Technologies: Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee*. Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. I: pp. 30-36.

Evans, R.J.; Milne, T.A. Chemistry of Tar Formation and Maturation in the Thermochemical Conversion of Biomass. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion*. London: Blackie Academic & Professional, 1997; Vol. II: pp. 803-816.

Johnson, D.K.; Davis, M.; Hames, B.; Chornet, E.; Shabtai, J.S.; Zmierczak, W. Chemical Characterization of Depolymerization Products from Lignin. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; Vol. 2: pp. 971-977.

Jollez, P.; Laborde, P.; Marquis, J.; Garro, J.M.; Chornet, E. Co-Products Strategies Based on Aqueous/Steam Treatments. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; Vol. 2: pp. 883-900.

Lede, J.; Diebold, J.P.; Peacocke, G.V.C.; Piskorz, J. Nature and Properties of Intermediate and Unvaporized Biomass Pyrolysis Materials. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion*. London: Blackie Academic & Professional, 1997; Vol. I: pp. 27-42.

Mann, M.K.; Spath, P.L. Technoeconomic Analysis and Life Cycle Assessment of an Integrated Biomass Gasification Combined Cycle System: Life Cycle Assessment of Biomass-to-Electricity. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion*. London: Blackie Academic & Professional, 1997; Vol. II: pp. 1567-1581.

Marano, J.J.; Rogers, S.; Spath, P.L.; Mann, M.K. Life-Cycle Assessment of Biomass-Derived Refinery Feedstocks for Reducing CO_2 Emissions. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; Vol. 1: pp. 325-337.

Milne, T.; Agblevor, F.; Davis, M.; Deutch, S.; Johnson, D. Review of the Chemical Composition of Fast-Pyrolysis Oils from Biomass. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion*. London: Blackie Academic & Professional, 1997; Vol. I: pp. 409-424.

Milne, T.A.; Evans, R.J.; Abatzoglou, N. Biomass Gasifier "Tars": Their Nature, Formation, Destruction, and Tolerance Limits in Energy Conversion Devices. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; Vol. 1: pp. 729-738.

Overend, R. Biomass and Bioenergy into the 21st Century. *Shigen to Kankyo*. 1997; 6(2): pp. 117-124.

Overend, R. USA—Biomass and Bioenergy 1996. *World Directory of Renewable Energy Suppliers and Services 1997*. London, UK: James & James Ltd., 1997; pp. 36-39.

Overend, R.P.; Chornet, E., eds. Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada. Oxford, UK: Pergamon, 1997; 2 Vols.: 1700 pp. Includes addendum (185 pp.).

Panigrahi, M.R.; Overend, R.P. Biomass Status vis-a-vis Bioenergy Prospects and Options for India. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; Vol. 1: pp. 79-89.

Petersen, G.R.; Davison, B.H. Conversion of Biomass to Chemicals: Current Examples and Opportunities. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials (Addendum): Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; 12 pp.

Scahill, J.; Diebold, J.P.; Feik, C. Removal of Residual Char Fines from Pyrolysis Vapors by Hot Gas Filtration. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion*. London: Blackie Academic & Professional, 1997; Vol. I: pp. 253-266.

Shaddix, C.R.; Huey, S.P. Combustion Characteristics of Fast Pyrolysis Oils Derived from Hybrid Poplar. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion*. London: Blackie Academic & Professional, 1997; Vol. I: pp.465-480. Work performed by Sandia National Laboratories, Livermore, California.

Spath, P.L.; Overend, R.P. Biomass Utilization in Cofiring Scenarios with a Gas Turbine Integrated Combined Cycle System. *Proceedings of the 1996 International Joint Power Generation Conference, Part 1*. New York, NY: American Society of Mechanical Engineers, 1996; pp. 345-354.

Turn, S.Q.; Kinoshita, C.M.; Ishimura, D.M.; Jenkins, B.M. Removal of Inorganic Constituents of Fresh Herbaceous Fuels: Processes and Costs. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; Vol. 1: pp. 401-414. Work performed by University of Hawaii, Honolulu, Hawaii, and University of California, Davis, California.

Wang, D.; Czernik, S.; Chornet, E. Production of Hydrogen from Biomass by Catalytic Steam Reforming of Fast Pyrolysis Oils. *Energy & Fuels*. January/February 1998; 12(1): pp. 19-24.

Wang, D.; Czernik, S.; Montane, D.; Mann, M.; Chornet, E. Hydrogen Production via Catalytic Steam Reforming of Fast Pyrolysis Oil Fractions. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada*. Oxford, UK: Pergamon, 1997; Vol. 1: pp. 845-854.

Buildings

Balcomb, J.D.; Beeler, G. Designing Low-Energy Buildings with Energy-10. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 23rd National Passive Solar Conference, 14-17 June 1998, Albuquerque, New Mexico*. Boulder, CO: American Solar Energy Society, 1998; pp. 277-282.

Balcomb, J.D.; Hestnes, A.G.; Hastings, S.R. Strategies for Solar Energy Houses. *World Directory of Renewable Energy Suppliers and Services 1997*. London, UK: James & James Ltd., 1997; pp. 122-129.

Dymond, C.; Kutscher, C. Development of a Flow Distribution and Design Model for Transpired Solar Collectors. *Solar Energy*. 1997; 60(5): pp. 291-300.

Hassani, V.; Miller, P.L. Thermal Comfort and Cold Air Distribution. *ASHRAE Transactions 1998: Proceedings of the 1998 American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., Winter Meeting, 18-21 January 1998, San Francisco, California*. Atlanta, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1998; Vol. 104, Part 2: pp. 1763-1772.

Kutscher, C.F. Transpired Solar Collector Systems (White paper). McIntyre, M., ed. *Solar Energy: Today's Technologies for a Sustainable Future*. Boulder, CO: American Solar Energy Society, August 1997; Chap. 3: pp. 46-48.

Kutscher, C.F. Transpired Solar Collector Systems: A Major Advance in Solar Heating. *Energy Business Technology Sourcebook: Proceedings of the 19th World Energy Engineering Congress, 6-8 November 1996, Atlanta, Georgia.* 1997; Chap. 61: pp. 481-489.

Slayzak, S.J.; Ryan, J.P. Instrument Uncertainty Effect on Calculation of Absolute Humidity Using Dewpoint, Wet Bulb, and Relative Humidity Sensors. Morehouse, J.M.; Hogan, R.E., eds. *Solar Engineering 1998: Proceedings of the International Solar Energy Conference, 14-17 June 1998, Albuquerque, New Mexico.* New York: American Society of Mechanical Engineers, 1998; pp. 473-479.

Taylor, P.E.; Becker, M.H.; Ezell, L.N. Technical Assistance for New Federal Buildings Case Study: Smithsonian Institution Air and Space Museum Dulles Center, Chapter 32. Ricketts, J., ed. *Energy and Environmental Visions for the New Millennium*. Lilburn, GA: The Fairmont Press, Inc., 1998; pp. 257-260.

Torcellini, P.A.; Hayter, S.J.; Ketcham, M.S.; Judkoff, R. Performance of a Low-Energy Commercial Building Designed Using a Whole-Building Approach. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 23rd National Passive Solar Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 33-38.

Chemical Technologies

Andersen, K.B.; Abildgaard, J.; Radziszewski, J.G.; Spanget-Larsen, J. Molecular and Vibrational Structure of 1,6, 6a 4-Trithiapentalene. Infrared Linear Dichroism Spectroscopy and ab Initio Normal-Mode Analyses. *Journal of Physical Chemisty A.* 1997; 101: pp. 4475-4480.

Blander, M. Inorganic Chemistry of Biomass Combustion: Problems and Solutions. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion.* London: Blackie Academic & Professional, 1997; Vol. II: pp. 1293-1302. Work performed by QUEST Research, South Holland, Illinois.

Bozell, J.J.; Black, S.K.; Cahill, D.; Johnson, D.K. Clean Fractionation of Lignocellulosics—Purification and Characterization of the Hemicellulose Component. *Proceedings of the 9th International Symposium on Wood and Pulping Chemistry, 9-12 June 1997, Montreal, Canada. Part 2: Poster Presentations.* Montreal, Canada: Canadian Pulp and Paper Association, 1997; pp. 11-1/11-4.

Dimmel, D.R.; Kuroda, K.; Pan, X.; Bozell, J.J. Pulping Catalysts from Lignin (8). Nitrogen Dioxide Oxidation of Lignins to Benzoquinones. *Journal of Wood Chemistry and Technology.* 1997; 17(3): pp. 235-258.

Elliott, D.C.; Neuenschwander, G.G. Liquid Fuels by Low-Severity Hydrotreating of Biocrude. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion.* London: Blackie Academic & Professional, 1997; Vol. I: pp. 611-621.

Filardo, G.; Galia, A.; Johnson, D.K.; Agblevor, F.A.; Eddy, F.P. Characterization of Wood and Bark Extractives from Three Eucalyptus Species. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials (Addendum): Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; 10 pp.

Hames, B.R.; Kurek, B. MnO_2-Oxylate Complex: A Natural and Abiotic Ligninolytic System. *Proceedings of the 9th International Symposium on Wood and Pulping Chemistry, 9-12 June 1997, Montreal, Canada. Part 1: Oral Presentations.* Montreal, Canada: Canadian Pulp and Paper Association, 1997; pp. G5-1/G5-4.

Kazi, K.M.F.; Chornet, E. Diffusion Model for the Chemical Impregnation of Hardwoods and Its Significance for Rapid Steam Treatments. *Paperi Ja Puu (Paper and Timber).* 1998; 80(1): pp. 41-48.

Kelley, S.S.; Wang, X.M.; Myers, M.D.; Johnson, D.K.; Chum, H.L. Biomass Oil-Modified Phenol Formaldehyde Resins. *Proceedings of the 9th International Symposium on Wood and Pulping Chemistry, 9-12 June 1997, Montreal, Canada. Poster Presentations.* Montreal, Canada: Canadian Pulp and Paper Association, 1997; Vol. 2: pp. 47-1/47-4.

Kurek, B.; Martinez-Inigo, M.J.; Artaud, I.; Hames, B.R.; Lequart, C.; Monties, B. Structural Features of Lignin Determining Its Biodegradation by Oxidative Enzymes and Related Systems. *Polymer Degradation and Stability.* 1998; Vol. 59: pp. 359-364.

Matsumura, Y.; Minowa, T.; Xu, X.; Nuessle, F.W.; Adschiri, T. High-Pressure Carbon Dioxide Removal in Supercritical Water Gasification of Biomass. Bridgwater, A.V.; Boocock, D.G.B., eds. *Developments in Thermochemical Biomass Conversion.* London: Blackie Academic & Professional, 1997; Vol. II: pp. 864-877. Work performed by University of Hawaii, Manoa, Honolulu, Hawaii.

Peterson, E.J.; Fanuele, J.C.; Nimlos, M.R.; Lemal, D.M.; Ellison, G.B.; Radziszewski, J.G. Nonplanarity of Tetrafluorocyclobutadiene. *Journal of the American Chemical Society.* 12 November 1997; 119(45): pp. 11,122-11,123.

Radziszewski, J.G.; Abildgaard, J.; Thulstrup, E.W. Vibrational Spectrum of Acenaphthylene: Linear Dichroism and Ab Initio Model Calculations. *Spectrochimica Acta Part A: Molecular Spectroscopy.* October 1997; 53(12): pp. 2095-2107.

Thompson, D.N.; Hames, B.R.; Reddy, C.A.; Grethlein, H.E. In Vitro Degradation of Natural Insoluble Lignin in Aqueous Media by the Extracellulara Perxidases of *Phanerochaete chrysosporium*. *Biotechnology and Bioengineering.* 1998; 57(6): pp. 704-717.

Tyson, K.S. New Look at Ethanol Market Penetration: Rates, Benefits, and Opportunities. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials: Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; Vol. 2: p. 1041.

Volkov, V.V.; Khotimskii, V.S.; Gokzhaev, M.B.; Litvinova, E.G.; Fadeev, A.G.; Kelley, S.S. Density and Free Volume of Poly[1-(Trimethylsilyl)-1-Propyne] Dense Films for Bioethanol Concentration by Organophilic Pervaporation. *Russian Journal of Physical Chemistry (Zhurnal Fizicheskoi Khimii): Proceedings of the Second International Conference on Catalysis in Membrane Reactors.* 1997; 71(9): pp. 1396-1399.

Energy Efficiency and Renewable Energy

Foster, R.; Cisneros, G.; Carrillo, O.; Ellis, A.; Buttner, L.; Durand, S.; Romero, A.; Graham, S.; Hanley, C.; Strachan, J.; Richards, E.; Rovero, C.; Ojinaga, L.; Corbus, D. USAID/DOE Mexico Renewable Energy Program: Building Foundations for Growing Markets. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 241-245.

Gay, C.F.; Moon, S.; Brown, H. Momentum at Last: Perspectives on the U.S. Renewable Energy Industry. *Energy Sources.* 1998; 20: pp. 97-102.

Junfeng, L.; Wan, Y.H.; Ohi, J.M. Renewable Energy Development in China: Resource Assessment, Technology Status, and Greenhouse Gas Mitigation Potential. *Applied Energy.* 1997; 56(3/4): pp. 381-394.

Energy Policy and Analysis

Byrne, J.; Shen, B.; Wallace, W. Economics of Sustainable Energy for Rural Development: A Study of Renewable Energy in Rural China. *Energy Policy.* 1998; 26(1): pp. 45-54.

Hewett, R. Strategy and Methodology for Rank-Ordering Virginia State Agencies Regarding "Solar Attractiveness" and Identification of Specific Project Possibilities. *IECEC-97: Proceedings of the Thirty-Second Intersociety Energy Conversion Engineering Conference, 27 July-1 August 1997, Honolulu, Hawaii.* Vol. 3: 1997; pp. 1921-1924.

Lilienthal, P.; Campbell, K. International Off-Grid Market Assessment for Dish/Stirling Systems. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 283-288.

Santos-Leon, G.; Zukor, S.; Hadder, G.; Walsh, M.; Glassner, D.; Pizzano, D.; Nguyen, T. Cellulosic Ethanol Economics and Climate Change Benefits. Overend, R.P.; Chornet, E., eds. *Making a Business from Biomass in Energy, Environment, Chemicals, Fibers and Materials (Addendum): Proceedings of the 3rd Biomass Conference of the Americas, 24-29 August 1997, Montreal, Quebec, Canada.* Oxford, UK: Pergamon, 1997; 11 pp.

Starrs, T.J. Net Metering: An Update on Legal and Regulatory Issues. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 193-198. Work performed by Kelso Starrs and Associates L.L.C., Vashon, Washington.

Swezey, B.G.; Houston, A.H.; Porter, K.L. Green Power Marketing Takes Off with Choice in Electricity. *Public Utilities Fortnightly.* August 1998; 136(15): pp. 46-51.

Tyson, K.S.; Bergeron, P.; Putsche, V. Modeling the Penetration of the Biomass-Ethanol Industry and Its Future Benefits. *Bioenergy '96—Partnerships to Develop and Apply Biomass Technologies: Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee.* Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. I: pp. 333-341.

Geothermal Energy

Brown, H. New Condensers for Geothermal Power. *CADDET Renewable Energy Newsletter.* September 1998; (3/98): pp. 13-15.

Gawlik, K.; Hassani, V. Advanced Binary Cycles: Optimum Working Fluids. *Transactions.* Geothermal Resources Council. September/October 1997; 21: pp. 497-502.

Gawlik, K.; Hassani, V. Advanced Binary Cycles: Optimum Working Fluids. *IECEC-97: Proceedings of the Thirty-Second Intersociety Energy Conversion Engineering Conference, 27 July-1 August 1997, Honolulu, Hawaii.* New York: American Institute of Chemical Engineers, 1997; Vol. 3: pp. 1809-1814. Benson, D.K.; Tracy, C.E.; Bechinger, C.

Hydrogen

Design and Development of a Low-Cost Fiber-Optic Hydrogen Detector. *Proceedings of the 1997 U.S. DOE Hydrogen Program Review, 21-23 May 1997, Herndon, Virginia.* NREL/CP-430-23722. Golden, CO: National Renewable Energy Laboratory, 1997; pp. 83-103.

Benson, D.K.; Tracy, C.E.; Hishmeh, G.; Ciszek, P.; Lee, S.H. Low-Cost Fiber-Optic Chemochromic Hydrogen Detector. *Proceedings of the 1998 U.S. DOE Hydrogen Program Review, 28-30 April 1998, Alexandria, Virginia.* NREL/CP-570-25315. Golden, CO: National Renewable Energy Laboratory, 1998; Vol. I: pp. 89-113.

Dillon, A.C.; Parilla, P.A.; Jones, K.M.; Riker, G.; Heben, M.J. Carbon Nanotube Materials for Hydrogen Storage. *Proceedings of the 1998 U.S. DOE Hydrogen Program Review, 28-30 April 1998, Alexandria, Virginia.* NREL/CP-570-25315. Golden, CO: National Renewable Energy Laboratory, 1998; Vol. II: pp. 539-556.

Dillon, A.C.; Parilla, P.A.; Jones, K.M.; Webb, J.D.; Landry, M.D.; Heben, M.J. Carbon Nanotube Materials for Hydrogen Storage. *Proceedings of the 1997 U.S. DOE Hydrogen Program Review, 21-23 May 1997, Herndon, Virginia.* NREL/CP-430-23722. Golden, CO: National Renewable Energy Laboratory, 1997; pp. 237-254.

Divilio, R.J. Modeling of Biomass to Hydrogen via the Supercritical Water Pyrolysis Process. *Proceedings of the 1998 U.S. DOE Hydrogen Program Review, 28-30 April 1998, Alexandria, Virginia.* NREL/CP-570-25315. Golden, CO: National Renewable Energy Laboratory, 1998; Vol. II: pp. 655-691. Work performed by Combustion Systems, Inc., Silver Spring, Maryland.

Ghirardi, M.L.; Flynn, T.; Forestier, M.; Seibert, M. Development of an Efficient Algal H_2-Production System. *Proceedings of the 1998 U.S. DOE Hydrogen Program Review, 28-30 April 1998, Alexandria, Virginia.* NREL/CP-570-25315. Golden, CO: National Renewable Energy Laboratory, 1998; Vol. I: pp. 43-60.

Ghirardi, M.L.; Flynn, T.; Markov, S.; Seibert, M. Development of an Efficient Algal H_2-Production System. *Proceedings of the 1997 U.S. DOE Hydrogen Program Review, 21-23 May 1997, Herndon, Virginia.* NREL/CP-430-23722. Golden, CO: National Renewable Energy Laboratory, 1997; pp. 11-24.

Glatzmaier, G.C.; Blake, D.M. Analysis of Hydrogen Production Methods Using Electrolysis and Concentrated Solar Energy. Morehouse, J.M.; Hogan, R.E., eds. *Solar Engineering 1998: Proceedings of the International Solar Energy Conference, 14-17 June 1998, Albuquerque, New Mexico.* New York: American Society of Mechanical Engineers, 1998; pp. 277-285.

Gregoire-Padro, C.E. Hydrogen, the Once and Future Fuel. *Energy & Fuels.* January/February 1998; 12(1): pp. 1-2.

Khaselev, O.; Bansal, A.; Kocha, S.; Turner, J.A. Photoelectrochemical-Based Direct Conversion Systems for Hydrogen Production. *Proceedings of the 1998 U.S. DOE Hydrogen Program Review, 28-30 April 1998, Alexandria, Virginia.* NREL/CP-570-25315. Golden, CO: National Renewable Energy Laboratory, 1998; Vol. I: pp. 161-173.

Mann, M.K.; Spath, P.L.; Amos, W.A. Technoeconomic Analysis of Different Options for the Production of Hydrogen from Sunlight, Wind, and Biomass. *Proceedings of the 1998 U.S. DOE Hydrogen Program Review, 28-30 April 1998, Alexandria, Virginia.* NREL/CP-570-25315. Golden, CO: National Renewable Energy Laboratory, 1998; Vol. I: pp. 367-390.

Markov, S.A.; Weaver, P.F.; Seibert, M. Spiral Tubular Bioreactors for Hydrogen Production by Photosynthetic Microorganisms: Design and Operation. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: pp. 577-584.

Thomas, C.E.; James, B.D.; Lomax, F.D., Jr. Market Penetration Scenarios for Fuel Cell Vehicles. *Proceedings of the 1997 U.S. DOE Hydrogen Program Review, 21-23 May 1997, Herndon, Virginia.* NREL/CP-430-23722. Golden, CO: National Renewable Energy Laboratory, 1997; pp. 451-484. Work performed by Directed Technologies, Inc., Arlington, Virginia.

Weaver, P.; Maness, P.C.; Markov, S.; Martin, S. Biological H_2 from Syngas and from H_2O. *Proceedings of the 1997 U.S. DOE Hydrogen Program Review, 21-23 May 1997, Herndon, Virginia.* NREL/CP-430-23722. Golden, CO: National Renewable Energy Laboratory, 1997; pp. 33-40.

Weaver, P.; Maness, P.C.; Rhodes, C.; Scahill, J.; Dundorf, S.; Martin, S. Biological H_2 from Fuel Gases and from H_2O. Proceedings of the 1998 U.S. DOE Hydrogen Program Review, 28-30 April 1998, Alexandria, Virginia. NREL/CP-570-25315. Golden, CO: National Renewable Energy Laboratory, 1998; Vol. I: pp. 1-8.

Materials Science and Semiconductors

Ahrenkiel, R. Induced-Eddy-Current-Sensor Measurement of Semiconductor Performance. *NASA Tech Briefs: Engineering Solutions for Design and Manufacturing.* March 1998; 22(3): 1 p.

Ahrenkiel, R.K.; Ahrenkiel, S.P.; Arent, D.J.; Olson, J.M.; Wanlass, M. Carrier Transport in Ordered and Disordered $In_{0.53}Ga_{0.47}As$. Moss, S.C., et al., eds. *Thin Films—Structure and Morphology: Proceedings of the Materials Research Society Symposium, 2-6 December 1996, Boston, Massachusetts.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 441: pp.181-186.

Alsina, F.; Cheong, H.M.; Webb, J.D.; Mascarenhas, A.; Geisz, J.F.; Olson, J.M. Far-Infrared Reflection Studies in Ordered $GaInP_2$. *Physical Review. B, Condensed Matter.* 15 November 1997—II; 56(20): pp. 13,126-13,131.

Bellaiche, L.; Kunc, K.; Besson, M. Bandgap Variation at the Isostructural Phase Transformation of Wurtzite InN. *MRS Internet Journal of Nitride Semiconductor Research.* 1996; 1(Art. 14): 6 pp.

Bertram, D.; Micic, O.I.; Nozik, A.J. Excited-State Spectroscopy of InP Quantum Dots. *Physical Review. B, Condensed Matter.* 15 February 1998—II; 57(8): pp. R4265-R4268.

Branz, H.M. Hydrogen Collision Model of Light-Induced Metastability in Hydrogenated Amorphous Silicon. *Solid State Communications.* February 1998; 105(6): pp. 387-391.

Cheong, H.M.; Alsina, F.; Mascarenhas, A.; Geisz, J.F.; Olson, J.M. Phonon Modes in Spontaneously Ordered $GaInP_2$ Studied by Micro-Raman Scattering Measurements. *Physical Review. B, Condensed Matter.* 15 July 1997—II; 56(4): pp. 1888-1892.

Cheong, H.M.; Mascarenhas, A.; Ahrenkiel, S.P.; Jones, K.M.; Geisz, J.F.; Olson, J.M. Effect of Microstructure on Excitonic Luminescence of Spontaneously Ordered $Ga_{0.52}In_{0.48}P$ Alloys. Journal of Applied Physics. 15 May 1998; 83(10): pp. 5418-5420.

Cheong, H.M.; Mascarenhas, A.; Ernst, P.; Geng, C. Effects of Spontaneous Ordering on Raman Spectra of $GaInP_2$. *Physical Review. B, Condensed Matter.* 15 July 1997—II; 56(4): pp. 1882-1887.

Cheong, H.M.; Mascarenhas, A.; Geisz, J.F.; Olson, J.M.; Keller, M.W.; Wendt, J.R. Statistical Distribution of the Order Parameter in Spontaneously Ordered $Ga_{0.52}In_{0.48}P$ Alloys. *Physical Review. B, Condensed Matter.* 15 April 1998—II; 57(16): pp. R9400-R9403.

Cheong, H.M.; Zhang, Y.; Mascarenhas, A.; Geisz, J.F.; Olson, J.M. Low-Temperature Cleaved-Edge Polarized-Photoluminescence Studies of Spontaneously Ordered $GaInP_2$ Alloys. *Journal of Applied Physics.* 1 February 1998; 83(3): pp. 1773-1775.

Cormier, R.A.; Gregg, B.A. Self-Organization in Thin Films of Liquid Crystalline Perylene Diimides. *Journal of Physical Chemistry B.* 1997; 101(51): pp. 11,004-11,006.

Cormier, R.A.; Gregg, B.A. Synthesis and Characterization of Liquid Crystalline Perylene Diimides. *Chemistry of Materials.* 1998; Vol. 10: pp. 1309-1319.

Deb, S.K. Ternary and Multinary Compound Semiconductors for Photovoltaic Applications. Tomlinson, R.D.; Hill, A.E.; Pilkington, R.D., eds. *Ternary and Multinary Compounds: Proceedings of the 11th International Conference on Ternary and Multinary Compounds, ICTMC-11, 8-12 September 1997, Salford, Great Britain.* Institute of Physics Conference Series Number 152. Philadelphia, PA: Institute of Physics Publishing Ltd., 1998; pp. 923-930.

Driessen, F.A.J.M.; Cheong, H.M.; Mascarenhas, A.; Hageman, P.R.; Bauhuis, G.J. Interface-Induced Conversion of Infrared to Visible Light at GaAs-AlGaInP Interfaces. Scheffler, M.; Zimmermann, R., eds. *23rd International Conference on the Physics of Semiconductors, 21-26 July 1996, Berlin, Germany.* Singapore: World Scientific, 1996; Vol. 2: pp. 991-994.

Fluegel, B.; Mascarenhas, A.; Geisz, J.F.; Olson, J.M. Second Harmonic Generation in Ordered $Ga_{1-x}In_xP$. *Physical Review. B,* Condensed Matter. 15 March 1998—II; 57(12): pp. R6787-R6790.

Fluegel, B.; Zhang, Y.; Cheong, H.M.; Mascarenhas, A.; Geisz, J.F.; Olson, J.M.; Duda, A. Exciton Absorption Bleaching Studies in Ordered $Ga_xIn_{1-x}P$. *Physical Review. B, Condensed Matter.* 15 May 1997—II; 55(20): pp. 13,647-13,650.

Herdt, G.C.; Jung, D.R.; Czanderna, A.W. Penetration of Deposited Ag and Cu Overlayers through Alkanethiol Self-Assembled Monolayers on Gold or Silver. *Zeitschrift für Physikalische Chemie.* 15 October 1997; Vol. 202: pp. 163-196.

Inglefield, C.E.; DeLong, M.C.; Taylor, P.C.; Geisz, J.F.; Olson, J.M. Microwave Modulated Photoluminescence as a Contactless Probe of Interface States. *Journal of Vacuum Science and Technology. B, Microelectronics, Processing and Phenomena.* July/August 1997; 15(4): pp. 1201-1204.

Jones, E.D.; Millunchick, J.M.; Follstaedt, D.; Lee, S.; Reno, J.; Twesten, R.D.; Zhang, Y.; Mascarenhas, A. Detection of Lateral Composition Modulation by Magnetoexciton Spectroscopy. *Physica E.* 1998; 2: pp. 44-48.

Keyes, B.M.; Ahrenkiel, R.K.; Shaw, G.J.; Summers, G.P. Minority-Carrier Lifetime Damage Coefficient of Irradiated InP. *Journal of Applied Physics.* 1 September 1997; 82(5): pp. 2156-2163.

Leong, J.K.; Williams, C.C.; Olson, J.M. Evidence of Internal Electric Fields in $GaInP_2$ by Scanning Capacitance and Near-Field Scanning Optical Microscopy. Physical Review. B, *Condensed Matter.* 15 July 1997—I; 56(3): pp. 1472-1478.

Mascarenhas, A.; Fluegel, B.; Zhang, Y.; Geisz, J.F.; Olson, J.M. Carrier Relaxation and Exciton Bleaching in Spontaneously Ordered GaInP. *Physica Status Solidi A.* 1997; 164(1): pp. 477-480.

Meier, A.; Kocha, S.S.; Hanna, M.C.; Nozik, A.J. Majority Charge Carrier Transfer Studies at n-Type III-V Semiconductor-Liquid Interfaces by Impedance Spectroscopy. Rajeshwar, K., et al., eds. *Proceedings of the Symposium on Photoelectrochemistry. Electrochemical Society Proceedings, Vol. 97-20.* Pennington, NJ: The Electrochemical Society, Inc., 1997; pp. 161-171.

Millunchick, J.M.; Twesten, R.D.; Lee, S.R.; Follstaedt, D.M.; Jones, E.D.; Ahrenkiel, S.P.; Zhang, Y.; Cheong, H.M.; Mascarenhas, A. Spontaneous Lateral Composition Modulation in AlAs/InAs Short Period Superlattices via the Growth Front. *Journal of Electronic Materials.* September 1997; 26(9): pp. 1048-1052.

Nelson, A.J.; Schwerdtfeger, C.R.; Herdt, G.C.; King, D.; Contreras, M.; Ramanathan, K.; O'Brien, W.L. X-ray Photoemission Analysis of Chemically Treated I-III-VI Semiconductor Surfaces. *Journal of Vacuum Science and Technology. A, Vacuum, Surfaces, and Films.* July/August 1997; 15(4): pp. 2058-2062.

Twesten, R.D.; Millunchick, J.M.; Ahrenkiel, S.P.; Zhang, Y.; Lee, S.R.; Follstaedt, D.M.; Mascarenhas, A.; Jones, E.D. Microstructure of Compositionally Modulated InAlAs. Moss, S.C., et al., eds. *Thin Films—Structure and Morphology: Proceedings of the Materials Research Society Symposium, 2-6 December 1996, Boston, Massachusetts.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 441: pp. 187-192.

Wang, T.H.; Ciszek, T.F. Impurity Segregation in LPE Growth of Silicon from Cu-Al Solutions. *Journal of Crystal Growth.* 1997; 174: pp. 176-181. Presented at the 10th American Conference on Crystal Growth, 4-9 August 1996, Vail, Colorado.

Zaban, A.; Ferrere, S.; Gregg, B.A. Relative Energetics at the Semiconductor/Sensitizing Dye/Electrolyte Interface. *Journal of Physical Chemistry B.* 1998; Vol. 102: pp. 452-460.

Zhang, Y.; Mascarenhas, A. Electronic and Optical Properties of Laterally Composition-Modulated $Al_xIn_{1-x}As$, $Ga_xIn_{1-x}P$, and $Ga_xIn_{1-x}As$ Alloys. *Physical Review. B, Condensed Matter.* 15 May 1998—I; 57(19): pp. 12,245-12,254.

Zhang, Y.; Mascarenhas, A. Orientational Superlattices Formed by CuPt-Ordered Zinc-Blende Semiconductor Alloys. *Physical Review. B, Condensed Matter.* 15 May 1997—I; 55(19): pp. 13,100-13,110.

Zhang, Y.; Mascarenhas, A.; Jones, E.D. Magnetoexcitons in Anisotropic Semiconductors. *Journal of Applied Physics.* 1 January 1998; 83(1): pp. 448-454.

National Renewable Energy Laboratory

Brown, H. FLC Innovators: Olson, Kurtz, Kibbler, Kramer, and Friedman, National Renewable Energy Laboratory. *The FLC Newslink.* January 1998: p. 6.

Photoconversion

Ellingson, R.; Sprague, J.; Fluegel, B.; Zaban, A.; Ferrere, S.; Nozik, A.J. Femtosecond Dynamics of Electron Injection from Ru-Based Dyes into Nanocrystalline TiO_2 Electrodes. *Proceedings of the Twenty-First DOE Solar Photochemistry Research Conference, 7-11 June 1997, Copper Mountain, Colorado.* NREL/CP-520-22968. 1997; p. 110.

Ferrere, S.; Gregg, B.A Dye Sensitized Solar Cells for Water Splitting and Fundamental Studies. *Proceedings of the Twenty-First DOE Solar Photochemistry Research Conference, 7-11 June 1997, Copper Mountain, Colorado.* NREL/CP-520-22068. 1997; p. 114.

Ferrere, S.; Gregg, B.A. Photosensitization of TiO_2 by $[Fe^{II}(2,2'\text{-bipyridine-}4,4'\text{-dicarboxylic acid})_2(CN_2)]$: Band Selective Electron Injection from Ultra-Short-Lived Excited States. *Journal of the American Chemical Society.* 1998; 120: pp. 843-844.

Frank, A.J.; Schlichthorl, G. Interfacial Photochemical Processes: Dye-Sensitized Nanocrystalline Semiconductor Electrodes. *Proceedings of the Twenty-First DOE Solar Photochemistry Research Conference, 7-11 June 1997, Copper Mountain, Colorado.* NREL/CP-520-22968. 1997; pp. 12-14.

Ghirardi, M.L.; Togasaki, R.K.; Seibert, M. Oxygen Sensitivity of Algal H_2-Production. *Applied Biochemistry and Biotechnology: Proceedings of the Eighteenth Symposium on Biotechnology for Fuels and Chemicals, 5-9 May 1996, Gatlinburg, Tennessee.* Spring 1997; Vols. 63-65: pp. 141-151.

Gregg, B.A.; Bechinger, C.; Pitts, R. Photoelectrochromic Smart Windows. Lampert, C.M., et al., eds. *Optical Materials Technology for Energy Efficiency and Solar Energy Conversion XV: Proceedings from the SPIE Annual Meeting, 28-29 July 1997, San Diego, California.* Bellingham, WA: Society of Photo-Optical Instrumentation Engineers, 1997; Vol. 3138: pp. 114-123.

Gregg, B.A.; Cormier, R.A.; Sprague, J. Long-Range Singlet Energy Transfer in Perylene Bis(imide) Films. *Proceedings of the Twenty-First DOE Solar Photochemistry Research Conference, 7-11 June 1997, Copper Mountain, Colorado.* NREL/CP-520-22968. 1997; p. 120.

Kocha, S.; Gao, X.; Frank, A.; Turner, J.A. Photoelectrochemical Based Direct Conversion Systems for Hydrogen Production. *Proceedings of the 1997 U.S. DOE Hydrogen Program Review, 21-23 May 1997, Herndon, Virginia.* NREL/CP-430-23722. Golden, CO: National Renewable Energy Laboratory, 1997; pp. 117-125.

Kocha, S.S.; Montgomery, D.; Peterson, M.W.; Turner, J.A. Photoelectrochemical Decomposition of Water Utilizing Monolithic Tandem Cells. *Solar Energy Materials and Solar Cells.* 1998; 52: pp. 389-397.

Mao, D.; Ibrahim, M.A.; Frank, A.J. Plasticized Polymer-Electrolyte-Based Photoelectrochemical Solar Cell. *Journal of the Electrochemical Society.* January 1998; 145(1): pp. 121-124.

Micic, O.I.; Nozik, A.J. Optical Properties, Energy Transfer and Electron Transfer in InP Quantum Dots and Closed Packed Films. *Proceedings of the Twenty-First DOE Solar Photochemistry Research Conference, 7-11 June 1997, Copper Mountain, Colorado.* NREL/CP-520-22968. 1997; p. 137.

Mohanty, P.; Seibert, M. Action of K-Crown Ether on Photosystem II Electron Transport: Characterization of the Site of Action. *Indian Journal of Biochemistry and Biophysics.* June 1997; 34(3): pp. 241-248.

Nozik, A.J.; Ellingson, R.J.; Meier, A.; Kocha, S.; Smith, B.B.; Hanna, M. Electron Transfer Dynamics at Semiconductor Electrode Structures. *Proceedings of the Twenty-First DOE Solar Photochemistry Research Conference, 7-11 June 1997, Copper Mountain, Colorado.* NREL/CP-520-22968. 1997; pp. 9-11.

Schlichthorl, G.; Huang, S.Y.; Sprague, J.; Frank, A.J. Intensity-Modulated Photovoltage Spectroscopy: A New Tool to Study the Recombination Kinetics in Dye-Sensitized TiO_2 Cells. *Proceedings of the Twenty-First DOE Solar Photochemistry Research Conference, 7-11 June 1997, Copper Mountain, Colorado.* NREL/CP-520-22968. 1997; p. 145.

Wang, T.H.; Ciszek, T.F. Numerical Simulations of Transient Photoconductance Decay. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 55-58.

Wei, X.; Lane, P.A.; Liess, M.; Vardeny, Z.V.; Ehrenfreund, E.; Ibrahim, M.; Frank, A.J. Triplet Excitations in Sexithiophene Films. *Synthetic Metals.* 1997; Vol. 84: pp. 565-566.

Zaban, A.; Meier, A.; Nozik, A.J.; Gregg, B.A. Impedance Spectroscopy of High Surface Area TiO_2 Electrodes. McBreen, J.; Mukerjee, S.; Srinivasan, S., eds. *Proceedings of the Electrochemical Society Symposium on Electrode Materials and Processes for Energy Conversion and Storage IV.* Pennington, NJ: The Electrochemical Society, Inc., 1997; Vol. 97-13: pp. 306-316.

Zaban, A.; Micic, O.I.; Gregg, B.A.; Nozik, A.J. Photosensitization of Nanoporous TiO_2 Electrodes with InP Quantum Dots. *Langmuir.* June 1998; 14(12): pp. 3153-3156.

Zhang, J.G.; Liu, P.; Tracy, C.E.; Benson, D.K.; Turner, J. High Performance Vanadium Oxide Thin Film Electrodes for Rechargable Lithium Batteries. Ginley, D.S., et al., eds. *Materials for Electrochemical Energy Storage and Conversion II—Batteries, Capacitors and Fuel Cells: Proceedings of the Materials Research Society Symposium, 1-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 496: pp. 379-384.

Zhang, J.G.; Liu, P.; Turner, J.A.; Tracy, C.E.; Benson, D.K. Highly Stable Vanadium Oxide Cathodes Prepared by Plasma-Enhanced Chemical Vapor Deposition. *Journal of the Electrochemical Society.* June 1998; 145(6): pp. 1889-1892.

Zhang, Y.; Fluegel, B.; Mascarenhas, A.; Geisz, J.F.; Olson, J.M.; Alsina, F.; Duda, A. Low-Temperature Birefringence in Ordered GaInP Alloy Studied by Polarized Transmission Spectroscopy. *Solid State Communications.* 1997; 104(10): pp. 557-580.

Solar Energy—General

Williamson, R.T. Designing an Effective Solar Portfolio Standard. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 561-564. Work performed by Arizona Corporation Commission, Phoenix, Arizona.

Williamson, R.T.; Wenger, H.J. Solar Portfolio Standard Analysis. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 565-570. Work performed by Arizona Corporation Commission, Phoenix, Arizona, and Pacific Energy Group, Walnut Creek, California.

Solar Energy—Photovoltaics

Abulfotuh, F.A.; Balcioglu, A.; Wangensteen, T.; Moutinho, H.R.; Hassoon, F.; Al-Douri, A.; Alnajjar, A.; Kazmerski, L.L. Study of the Defect Levels, Electro-optics, and Interface Properties of Polycrystalline CdTe and CdS Thin Films and Their Junction. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 451-454.

Ahrenkiel, R.K.; Ahrenkiel, S.P.; Al-Jassim, M.M.; Venkatasubramanian, R. Electronic and Mechanical Properties of Ge Films Grown on Glass Substrates. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 527-529.

Ahrenkiel, R.K.; Ellingston, R.; Johnston, S.; Wanlass, M. Recombination Lifetime of $In_{0.53}Ga_{0.47}As$ as a Function of Doping Density. *Applied Physics Letters.* 29 June 1998; 72(26): pp. 3470-3472.

Ahrenkiel, R.K.; Johnston, S. Contactless Measurement of Recombination Lifetime in Photovoltaic Materials. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 119-122.

Ahrenkiel, R.K.; Johnston, S. Contactless Measurement of Recombination Lifetime in Photovoltaic Materials. *Solar Energy Materials and Solar Cells.* 1998; Vol. 55: pp. 59-73.

Ahrenkiel, R.K.; Levi, D.H.; Johnston, S.; Song, W.; Mao, D.; Fischer, A. Photoconductive Lifetime of CdS Used in Thin-Film Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 535-538.

Ahrenkiel, S.P.; Ahrenkiel, R.K.; Arent, D.J. Domain Structure and Transient Photoconductivity in Ordered $Ga_{0.47}In_{0.53}As$ Epitaxial Films. Moss, S.C., et al., eds. *Thin Films—Structure and Morphology: Proceedings of the Materials Research Society Symposium, 2-6 December 1996, Boston, Massachusetts.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 441: pp. 133-138.

Albin, D.; Dhere, R.; Swartzlander-Guest, A.; Rose, D.; Li, X.; Levi, D.; Niles, D.; Moutinho, H.; Matson, R.; Sheldon, P. Interface Reactions in CdTe Solar Cell Processing. Jones, E.D., et al., eds. *Thin-Film Structures for Photovoltaics: Proceedings of the Materials Research Society Symposium, 2-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 485: pp. 215-220.

Albin, D.; Rose, D.; Dhere, R.; Levi, D.; Woods, L.; Swartzlander, A.; Sheldon, P. Comparison Study of Close-Spaced Sublimated and Chemical Bath Deposited CdS Films: Effects on CdTe Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 367-370.

Aldrich, D.J.; Jones, K.M.; Govindarajan, S.; Moore, J.J.; Ohno, T.R. Microstructure of Molybdenum Disilicide-Silicon Carbide Nanocomposite Thin Films. *Journal of the American Ceramic Society.* June 1998; 81(6): pp. 1471-1476.

Bai, Y.; Ford, D.H.; Rand, J.A.; Hall, R.B.; Barnett, A.M. 16.6% Efficient Silicon-Film™ Polycrystalline Silicon Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 35-38. Work performed by AstroPower, Inc., Newark, Delaware.

Banerjee, A.; Yang, J.; Guha, S. Improved Amorphous Silicon Alloy Solar Cells for Module Fabrication. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 711-716. Work performed by United Solar Systems Corporation, Troy, Michigan.

Bechinger, C.; Gregg, B.A. Development of a New Self-Powered Electrochromic Device for Light Modulation Without External Power Supply. *Solar Energy Materials and Solar Cells.* 1998; Vol. 54: pp. 405-410.

Bhattacharya, R.N.; Granata, J.E.; Batchelor, W.; Hasoon, F.; Wiesner, H.; Ramanathan, K.; Keane, J.; Noufi, R.N.; Sites, J.R. $CuIn_{1-x}Ga_xSe_2$-Based Photovoltaic Cells from Electrodeposited Precursor. Lampert, C.M., et al., eds. *Optical Materials Technology for Energy Efficiency and Solar Energy Conversion XV: Proceedings from the SPIE Annual Meeting, 28-29 July 1997, San Diego, California.* Bellingham, WA: Society of Photo-Optical Instrumentation Engineers, 1997; Vol. 3138: pp. 90-95.

Birkmire, R.W. Recent Progress and Critical Issues in Thin Film Polycrystalline Solar Cells and Modules. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 295-300. Work performed by University of Delaware, Newark, Delaware.

Biswas, R.; Li, Q.; Yoon, Y.; Branz, H.M. Dangling-Bond Levels and Structure Relaxation in Hydrogenated Amorphous Silicon. *Physical Review. B, Condensed Matter.* 15 October 1997—I; 56(15): pp. 9197-9200.

Bower, W.; Thomas, H.; Kroposki, B.; Bonn, R.; Hund, T. Balance-of-System Improvements for Photovoltaic Applications Resulting from the PVMaT Phase 4A1 Program. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1093-1096. Work performed by Sandia National Laboratories, Albuquerque, New Mexico.

Britt, J.S.; Delahoy, A.E.; Kiss, Z.J. Pilot Production of CIGS Photovoltaic Modules. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 335-338. Work performed by Energy Photovoltaics, Inc., Princeton, New Jersey.

Bulovic, V.; Burrows, P.E.; Garbuzov, D.Z.; Thompson, M.E.; Tsekoun, A.G.; Forrest, S.R. Photovoltaic Cells Based on Vacuum Deposited Molecular Organic Thin Films. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 235-242. Work performed by Princeton University, Princeton, New Jersey; Sarnoff Corporation, Princeton, New Jersey; and University of Southern California, Los Angeles, California.

Calixto, M.E.; Bhattacharya, R.N.; Sebastian, P.J.; Fernandez, A.M.; Gamboa, S.A.; Noufi, R.N. $Cu(In,Ga)Se_2$-Based Photovoltaic Structure by Electrodeposition and Processing. *Solar Energy Materials and Solar Cells.* 1998; Vol. 55: pp. 23-29.

Carlson, D.E. High-Volume Manufacturing Issues: Toxicity, Materials Supply, Yield Management, and Marketing. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 11-19. Work performed by Solarex Corporation, Newtown, Pennsylvania.

Carlson, D.E.; Rajan, K.; Bradley, D. Irreversible Light-Induced Degradation in Amorphous Silicon Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 595-598. Work performed by Solarex Corporation, Newtown, Pennsylvania.

Chen, C.C.; Zhong, F.; Cohen, J.D.; Yang, J.C.; Guha, S. Significance of Charged Defects in Understanding the Light-Induced Degradation of Hydrogenated Amorphous Silicon-Germanium Alloys. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 55-60. Work performed by University of Oregon, Eugene, Oregon, and United Solar Systems Corporation, Troy, Michigan.

Ciszek, T.F.; Wang, T.H. Growth and Properties of Silicon Filaments for Photovoltaic Applications. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 103-106.

Ciszek, T.F.; Wang, T.H.; Doolittle, W.A.; Rohatgi, A. Minority-Carrier Lifetime Degradation in Silicon Co-Doped with Iron and Gallium. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 59-62.

Conboy, J.C.; Olson, E.J.C.; Adams, D.M.; Kerimo, J.; Zaban, A.; Gregg, B.A.; Barbara, P.F. Impact of Solvent Vapor Annealing on the Morphology and Photophysics of Molecular Semiconductor Thin Films. *Journal of Physical Chemistry B.* 1998; Vol. 102: pp. 4516-4525.

Contreras, M.A.; Egaas, B.; Dippo, P.; Webb, J.; Asher, S.; Swartzlander, A.; Ramanathan, K.; Hasoon, F.S.; Noufi, R. Changes to the Electrical and Structural Properties of Polycrystalline Thin-Film $Cu(In,Ga)Se_2$ Materials by the Use of Thin MF (M=Na, K, Cs) Precursor Layers. Tomlinson, R.D.; Hill, A.E.; Pilkington, R.D., eds. *Ternary and Multinary Compounds: Proceedings of the 11th International Conference on Ternary and Multinary Compounds, ICTMC-11, 8-12 September 1997, Salford, Great Britain.* Institute of Physics Conference Series Number 152. Philadelphia, PA: Institute of Physics Publishing Ltd., 1998;
pp. 333-336.

Contreras, M.A.; Egaas, B.; Dippo, P.; Webb, J.; Granata, J.; Ramanathan, K.; Asher, S.; Swartzlander, A.; Noufi, R. On the Role of Na and Modifications to $Cu(In,Ga)Se_2$ Absorber Materials Using Thin-MF (M=Na, K, Cs) Precursor Layers. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 359-362.

Contreras, M.A.; Noufi, R. Chalcopyrite $Cu(In,Ga)Se_2$ and Defect Chalcopyrite $Cu(In,Ga)_3Se_5$ Materials in Photovoltaic P-N Junctions. *Journal of Crystal Growth.* 1997; Vol. 174: pp. 283-288.

Contreras, M.; Wiesner, H.; Webb, J. Thin-Film Polycrystalline $Ga_{1-x}In_xSb$ Materials. Coutts, T.J.; Allman, C.S.; Benner, J.P., eds. *Thermophotovoltaic Generation of Electricity: Third NREL Conference, May 1997, Colorado Springs, Colorado.* AIP Conference Proceedings No. 401. Woodbury, NY: American Institute of Physics, 1997; pp. 403-410.

Contreras, M.A.; Wiesner, H.; Tuttle, J.; Ramanathan, K.; Noufi, R. Issues on the Chalcopyrite/Defect-Chalcopyrite Junction Model for High-Efficiency $Cu(In,Ga)Se_2$ Solar Cells. *Solar Energy Materials and Solar Cells.* December 1997; 49(1-4): pp. 239-247.

Coutts, T.; Fitzgerald, M. Thermophotovoltaics: The Potential for Power. *Physics World.* August 1998; Vol. 11: pp. 49-52.

Coutts, T.J. Thermophotovoltaic Principles, Potential, and Problems. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 24-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 217-233.

Coutts, T.J.; Allman, C.S.; Benner, J.P., eds. Thermophotovoltaic Generation of Electricity: Third NREL Conference, May 1997, Colorado Springs, Colorado. AIP Conference Proceedings No. 401. Woodbury, NY: American Institute of Physics, 1997; 605 pp.

Coutts, T.J.; Fitzgerald, M.C. Thermophotovoltaics. *Scientific American.* September 1998; 279(3): pp. 68-73.

Crandall, R.S.; Liu, X.; Iwaniczko, E. Recent Developments in Hot-Wire Amorphous Silicon. *Journal of Non-Crystalline Solids.* 1998; Vols. 227-230: pp. 23-28.

Crandall, R.S.; Mahan, A.H.; Iwaniczko, E.; Jones, K.M.; Liu, X.; White, B.E.; Pohl, R.O. New Results on the Microstructure of Amorphous Silicon as Observed by Internal Friction. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 191-196.

Cudzinovic, M.; Sopori, B.L. Electronic and Optical Properties of Si-Al Contacts Produced by Optical Excitation. Ravindra, N.M.; Singh, R.K., eds. *Transient Thermal Processing Techniques in Electronic Materials.* Proceedings of a Symposium sponsored by the Thin Films & Interfaces Committee of the Electronic, Magnetic and Photonic Materials Division of TMS, 4-8 February 1996, Anaheim, California. Warrendale, PA. The Minerals, Metals and Materials Society, 1996; pp. 79-81.

Czanderna, A.W. Reliability and Lifetime Issues for New Photovoltaic Technologies. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 24-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 55-69.

Dake, L.S.; Lad, R.J. Ultrathin Al Overlayers on Clean and K-Covered $TiO_2(110)$ Surfaces. *Surface Science Spectra.* 1998; 4(3): pp. 232-245.

Dalal, V.L.; Maxson, T.; Girvan, R.; Haroon, S. Stability of Single and Tandem Junction A-Si:H Solar Cells Grown Using the ECR Process. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 813-817. Work performed by Iowa State University, Ames, Iowa.

Dalal, V.L.; Maxson, T.; Hahn, K. Properties of a-Si:H and a-(Si,Ge):H Solar Cells Prepared Using ECR Deposition Techniques. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 695-698. Work performed by Iowa State University, Ames, Iowa.

Deb, S.K. Novel Material Architectures for Photovoltaics. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 24-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 325-334.

Deb, S.K.; Ferrere, S.; Frank, A.J.; Gregg, B.A.; Huang, S.Y.; Nozik, A.J.; Schlichthorl, G.; Zaban, A. Photochemical Solar Cells Based on Dye-Sensitization of Nanocrystalline TiO_2. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1887, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 507-510.

del Cueto, J.A.; McMahon, T.J. Performance of Single-Junction a-Si Modules Under Varying Conditions in the Field. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1205-1208.

Deng, X.; Jones, S.J.; Liu, T.; Izu, I.; Ovshinsky, S.R. Improved -c-Si p-Layer and a-Si i-Layer Materials using VHF Plasma Deposition. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 591-594. Work performed by Energy Conversion Devices, Inc., Troy, Michigan.

Deng, X.; Jones, S.J.; Liu, T.; Izu, M.; Ovshinsky, S.R.; Hoffman, K. VHF Plasma Deposition of -c-Si p-Layer Materials. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 795-806. Work performed by Energy Conversion Devices, Inc., Troy, Michigan, and United Solar Systems Corporation, Troy, Michigan.

Dhere, N.G. Appropriate Materials and Preparation Techniques for Polycrystalline Thin-Film Thermophotovoltaic Cells. Coutts, T.J.; Allman, C.S.; Benner, J.P., eds. *Thermophotovoltaic Generation of Electricity: Third NREL Conference, May 1997, Colorado Springs, Colorado.* AIP Conference Proceedings No. 401. Woodbury, NY: American Institute of Physics, 1997; pp. 423-442.

Dhere, R.; Rose, D.; Albin, D.; Asher, S.; Al-Jassim, M.; Cheong, H.; Swartzlander, A.; Moutinho, H.; Coutts, T.; Ribelin, R.; Sheldon, P. Influence of CdS/CdTe Interface Properties on the Device Properties. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 435-438.

Dong, S.; Tang, Y.; Liebe, J.; Braunstein, R.; Crandall, R.S.; Nelson, B.P.; Mahan, A.H. Transport Properties of Intrinsic Hydrogenated Amorphous Silicon Produced by the Hot-Wire Technique Investigated by the Photomixing Technique. *Journal of Applied Physics.* 15 July 1997; 82(2): pp. 702-707.

Eisgruber, I.; Matson, R.; McMahon, T.J. Automated Screening for Severe Shunting Defects in Encapsulated Series-Connected Modules. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 727-730.

Erickson, K.; Dalal, V.L.; Chumanov, G. Growth of Micro-Crystalline Si:H and (Si,Ge):H on Polymide Substrates Using ECR Deposition Techniques. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 409-413. Work performed by Iowa State University, Ames, Iowa.

Ferekides, C.; Marinskiy, D.; Morel, D.L. CdS: Characterization and Recent Advances in CdTe Solar Cell Performance. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 339-342. Work performed by University of South Florida, Tampa, Florida.

Ferekides, C.; Poorsala, U.; Morel, D.L. Effect of SnO_2 Roughness on the Properties of CdTe/CdS Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp.427-430. Work performed by University of South Florida, Tampa, Florida.

Ferekides, C.S.; Viswanathan, V.; Morel, D.L. RF Sputtered Back Contacts for CdTe/CdS Thin Film Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 423-426. Work performed by University of South Florida, Tampa, Florida.

Fernandez, A.M.; Calixto, M.E.; Sebastian, P.J.; Gamboa, S.A.; Hermann, A.M.; Noufi, R.N. Electrodeposited and Selenized ($CuInSe_2$) (CIS) Thin Films for Photovoltaic Applications. *Solar Energy Materials and Solar Cells.* 1998; Vol. 52: pp. 423-431.

Field, H. Solar Cell Spectral Response Measurement Errors Related to Spectral Band Width and Chopped Light Waveform. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 471-474.

Fischer, A.; Feng, Z.; Bykov, E.; Contreras-Puente, G.; Compaan, A.; Castillo-Alvarado, F.; Avendano, J.; Mason, A. Optical Phonons in Laser-Deposited CdS_xTe_{1-x} Films. *Applied Physics Letters.* 16 June 1997; 70(24): pp. 3239-3241.

Ford, D.H.; Rand, J.A.; Barnett, A.M.; DelleDonne, E.J.; Ingram, A.E.; Hall, R.B. Development of Light-Trapped, Interconnected, Silicon-Film Modules. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 631-634. Work performed by AstroPower, Inc., Newark, Delaware.

Frank, A.J.; Gregg, B.A.; Gratzel, M.; Nozik, A.J.; Zaban, A.; Ferrere, S.; Schlichthorl, G.; Huang, S.Y. Photochemical Solar Cells Based on Dye-Sensitization of Nanocrystalline TiO_2. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 145-153.

Friedman, D.J.; Kibbler, A.E.; Reedy, R. Selection of Substrate Orientation and Phosphorous Flux to Achieve p-type Carbon Doping of $Ga_{0.5}In_{0.5}P$ by Molecular Beam Epitaxy. *Applied Physics Letters.* 25 August 1997; 71(8): pp. 1095-1097.

Fujiwara, H.; Koh, J.K.; Lee, Y.; Wronski, C.R.; Collins, R.W. Real-Time Spectroscopic Ellipsometry Studies of the Top Junctions of a-Si:H-Based Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 599-602. Work performed by Pennsylvania State University, University Park, Pennsylvania.

Gee, J.M.; Sopori, B.L. Effect of Gettering on Areal Inhomogeneities in Large-Area Multicrystalline-Silicon Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 155-158.

Gessert, T.A.; Sheldon, P.; Li, X.; Dunlavy, D.; Niles, D.; Sasala, R.; Albright, S.; Zadler, B. Studies of ZnTe Back Contacts to CdS/CdTe Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 419-422.

Gillespie, T.J.; Lanning, B.R.; Marshall, C.H.; Contreras, M. Large-Area Copper Indium Diselenide (CIS) Process, Control and Manufacturing. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 403-406. Work performed by Lockheed Martin Astronautics, Denver, Colorado.

Gillespie, T.J.; Miles, W.A.; del Cueto, J.A. Reactive Magnetron Sputtering of Transparent and Conductive Zinc Oxide Films Deposited at High Rates onto CIS/CIGS Photovoltaic Devices. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 487-490. Work performed by Lockheed Martin Astronautics, Denver, Colorado.

Ginley, D.S.; Perkins, J.D.; McGraw, J.M.; Parilla, P.A. $LiCoO_2$ Thin Films Grown by Pulsed Laser Deposition on Low-Cost Substrates. Ginley, D.S., et al., eds. *Materials for Electrochemical Energy Storage and Conversion II—Batteries, Capacitors and Fuel Cells: Proceedings of the Materials Research Society Symposium, 1-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 496: pp. 293-302.

Granata, J.E.; Sites, J.R.; Asher, S.; Matson, R.J. Quantitative Incorporation of Sodium in $CuInSe_2$ and $Cu(In,Ga)Se_2$ Photovoltaic Devices. Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. New York: Institute of Electrical and Electronics Engineers, 1997; pp. 387-390. Work performed by Colorado State University, Fort Collins, Colorado, and the National Renewable Energy Laboratory, Golden, Colorado.

Green, M.A.; Emery, K.; Bucher, K.; King, D.L.; Igari, S. Solar Cell Efficiency Tables (Version 10). *Progress in Photovoltaics: Research and Applications.* July-August 1997; 5(4): pp. 265-268.

Guha, S.; Yang, J.; Banerjee, A.; Hoffman, K.; Sugiyama, S.; Call, J.; Jones, S.J.; Deng, X.; Doehler, J.; Izu, M.; Ovshinsky, H.C. Triple-Junction Amorphous Silicon Alloy PV Manufacturing Plant of 5 MW Annual Capacity. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 607-610. Work performed by United Solar Systems Corporation, Troy, Michigan, and Energy Conversion Devices, Inc., Troy, Michigan.

Han, D.; Wang, K.; Yeh, C.; Yang, L.; Deng, X.; von Roedern, B. Luminescence in Amorphous Silicon p-i-n Diodes under Double-Injection Dispersive-Transport-Controlled Recombination. *Physical Review. B, Condensed Matter.* 15 June 1997; 55(23): pp. 15,619-15,629.

Han, D.; Yeh, C.; Wang, K.; Wang, Q. Internal Electric Field Profile in Thin Film Hydrogenated Amorphous Silicon Diodes Studied by the Transient-Null-Current Method. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 729-734. Work performed by University of North Carolina, Chapel Hill, North Carolina, and March Instruments, Concord, California.

Hanna, M.C.; Lu, Z.; Nozik, A.J. Hot Carrier Solar Cells. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 309-316.

Hanoka, J.I.; Kane, P.E.; Martz, J.; Fava, J. Low-Cost Module and Mounting Systems Developed Through Evergreen Solar's PVMaT Program. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1081-1092. Work performed by Evergreen Solar, Inc., Waltham, Massachusetts.

Hasoon, F.S.; Al-Jassim, M.M.; Swartzlander, A.; Sheldon, P.; Al- Douri, A.A.J.; Alnajjar, A.A. Morphology of CdS Thin Films Deposited on SnO_2-Coated Glass Substrates. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 543-546.

Hegedus, S.S.; Albright, S.; Jeffrey, F.; McMahon, T.J.; Wiedeman, S. Substrates, Contacts and Monolithic Integration. *Progress in Photovoltaics: Research and Applications.* Papers from the 25th Anniversary Symposium of the Institute of Energy Conversion, 1-2 May 1997, Newark, Delaware. September-October 1997; 5(5): pp. 365-370.

Hegedus, S.S.; Buchanan, W.A.; Eser, E. Improving Performance of Superstrate p-i-n a-Si Solar Cells by Optimization of n/TCO/Metal Back Contacts. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 603-606. Work performed by University of Delaware, Newark, Delaware.

Herig, C.; Stevens, J.; Wenger, H.; Hoff, T.; Furseth, D. QuickScreen Software for Distributed PV Evaluation. *Proceedings of the Annual Utility PV Experience Exhibition & Conference, 15-18 October 1996, Lakewood, Colorado.* Report to utilities on results from TEAM-UP ventures and other photovoltaic commercialization activities. Washington, DC: Utility PhotoVoltaic Group, 1997; pp. 145-153.

Hoff, T.E.; Wenger, H.J.; Herig, C.; Shaw, R.W., Jr. Micro-Grid with PV, Fuel Cells, and Energy Efficiency. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 225-230.

Jagannathen, B.; Wallace, R.L.; Anderson, W.A.; Ahrenkiel, R.N. Amorphous and Microcrystalline Silicon by ECR-CVD Using Highly Dilute Silane Mixtures. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 675-678. Work performed by State University of New York, Amherst, New York, and Evergreen Solar, Inc., Waltham, Massachusetts.

Jiang, L.; Schiff, E.A.; Finger, F.; Hapke, P.; Koynov, S.; Schwarz, R.; Wyrsch, N.; Shah, A.; Yang, J.; Guha, S. Electroabsorption Spectra of Hydrogenated Amorphous and Microcrystalline Silicon. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 295-300. Work performed by Syracuse University, Syracuse, New York; Forschungszentrum Juelich GmbH, Juelich, Germany; University of Munich, Garching, Germany; University de Neuchatel, Neuchatel, Switzerland; and United Solar Systems Corporation, Troy, Michigan.

Jiao, L.; Semoushikina, S.; Lee, Y.; Wronski, C.R. Self-consistent Analysis of Mobility-Lifetime Products and Subgap Absorption on Different PECVD a-Si:H Films. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 233-238. Work performed by Pennsylvania State University, University Park, Pennsylvania.

Jones, E.D.; Kalejs, J.; Noufi, R.; Sopori, B., eds. Thin-Film Structures for Photovoltaics: Proceedings of the Materials Research Society Symposium, 2-5 December 1997, Boston, Massachusetts. Pittsburgh, PA: Materials Research Society, 1998. Vol. 485: 323 pp.

Kadirgan, F.; Mao, D.; Balcioglu, A.; McCandless, B.E.; Song, W.; Ohno, T.R.; Trefny, J.U. Electrodeposited CdS Thin Films and Their Application in CdS/CdTe Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 443- 445. Work performed by Colorado School of Mines, Golden, Colorado; Istanbul Technical University, Istanbul, Turkey; TUBITAK, Kocaeli, Turkey; University of Delaware, Newark, Delaware.

Kazmerski, L.L. Measurements and Characterization in Photovoltaics: Lessons Learned for TPV. Coutts, T.J.; Allman, C.S.; Benner, J.P., eds. *Thermophotovoltaic Generation of Electricity: Third NREL Conference, May 1997, Colorado Springs, Colorado.* AIP Conference Proceedings No. 401. Woodbury, NY: American Institute of Physics, 1997; pp. 549-558.

Kazmerski, L.L. Photovoltaics Characterization: Beyond the Horizon. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 24-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 29-44.

Kazmerski, L.L. Photovoltaics: A Review of Cell and Module Technologies. *Renewable and Sustainable Energy Reviews.* March 1997; 1(1/2): pp. 71-170.

Kern, G.A. SunSine300, Utility Interactive AC Module Anti-Islanding Test Results. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1265-1268. Work performed by Ascension Technology, Inc., Boulder, Colorado.

Keyes, B.M.; Hasoon, F.; Dippo, P.; Balcioglu, A.; Abulfotuh, F. Influence of Na on the Electro-Optical Properties of $Cu(In,Ga)Se_2$. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 479-482.

King, D.E.; Pern, F.J.; Pitts, J.R.; Bingham, C.E.; Czanderna, A.W. Optical Changes in Cerium-Containing Glass as a Result of Accelerated Exposure Testing. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* 1997; pp. 1117-1120.

King, D.L.; Myers, D.R. Silicon-Photodiode Pyranometers: Operational Characteristics, Historical Experiences, and New Calibration Procedures. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* 1997; pp. 1285-1288.

Koh, J.; Fujiwara, H.; Wronski, C.R.; Collins, R.W. Structural and Optical Properties of a-Si:H/-c-Si:H:B Junctions in the a-Si:H-Based n-i-p Solar Cell Configuration. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 705-710. Work performed by Pennsylvania State University, University Park, Pennsylvania.

Koshka, Y.; Ostapenko, S.; Cao, J.; Kalejs, J.P. Relationship Between Room Temperature Photoluminescence and Electronic Quality in Multicrystalline Silicon. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 115-118. Work performed by University of South Florida, Tampa, Florida, and ASE Americas, Inc., Billerica, Massachusetts.

Kroposki, B.; Hansen, R. Technical Evaluation of Four Amorphous Silicon Systems at NREL. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1357-1360.

Kurtz, S.R.; McConnell, R.D. Requirements for a 20%-Efficient Polycrystalline GaAs Solar Cell. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 24-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 191-205.

Kurtz, S.R.; Myers, D.; Olson, J.M. Projected Performance of Three- and Four-Junction Devices Using GaAs and GaInP. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 875-878.

Kurtz, S.R.; Olson, J.M.; Friedman, D.J.; Reedy, R. Effect of Front-Surface Doping on Back-Surface Passivation in $Ga_{0.5}In_{0.5}P$ Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 819-822.

Kwon, D.; Cohen, J.D.; Garcia, R. AFM Study of the Effect of Growth Method and Conditions on the Microstructure of a-Si:H. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 567-566. Work performed by University of Oregon, Eugene, Oregon, and Instituto de Microelectronica de Madrid, Tres Cantos, Spain.

Lee, Y.; Ferlauto, A.S.; Wronski, C.R. Contributions of Bulk, Interface and Built-In Potential to the Open Circuit Voltage of a-Si:H Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 683-686. Work performed by Pennsylvania State University, University Park, Pennsylvania.

Lee, Y.; Jiao, L.; Koh, J.; Fujiwara, H.; Lu, Z.; Collins, R.W.; Wronski, C.R. Impact of Hydrogen Dilution on the Properties and Light Induced Changes of a-Si:H Based Materials and Solar Cells. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 747-752. Work performed by Pennsylvania State University, University Park, Pennsylvania.

Levi, D.H.; Woods, L.M.; Albin, D.S.; Gessert, T.A.; Niles, D.W.; Swartzlander, A.; Rose, D.H.; Ahrenkiel, R.K.; Sheldon, P. Back Contact Effects on Junction Photoluminescence in CdTe/CdS Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 351-354.

Levi, D.H.; Woods, L.M.; Albin, D.S.; Gessert. T. A.; Niles, D.W.; Swartzlander, A.; Rose, D.H.; Ahrenkiel, R.K.; Sheldon, P. Effects of Back Contact Treatments on Junction Photoluminescence in CdTe/CdS Solar Cells. Jones, E.D., et al., eds. *Thin-Film Structures for Photovoltaics: Proceedings of the Materials Research Society Symposium, 2-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 485: pp. 209-214.

Liu, X.; Pohl, R.O.; Asher, S.; Crandall, R.S. Contamination of Silicon During Ion-Implantation and Annealing. *Journal of Non-Crystalline Solids.* 1998; Vols. 227-230: pp. 407-410.

Liu, X.; White, B.E., Jr.; Pohl, R.O.; Iwanizcko, E.; Jones, K.M.; Mahan, A.H.; Nelson, B.N.; Crandall, R.S.; Veprek, S. Amorphous Solid without Low-Energy Excitations. *Physical Review Letters.* 9 June 1997; 78(23): pp. 4418-4421.

Mahan, A.H.; Williamson, D.L.; Furtak, T.E. Observation of Improved Structural Ordering in Low H Content, Hot-Wire-Deposited a-Si:H. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 657-662.

Marudachalam, M.; Birkmire, R.W.; Hichri, H.; Schultz, J.M.; Swartzlander, A.; Al-Jassim, M.M. Phases, Morphology,

and Diffusion in $CuIn_xGa_{1-x}Se_2$ Thin Films. Journal of Applied Physics. 15 September 1997; 82(6): pp. 2896-2905.

Mascarenhas, A.; Zhang, Y.; Millunchick, J.M.; Twesten, R.D.; Jones, E.D. Lateral Superlattice Solar Cells. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 303-308.

Matulionis, I.; Nakade, S.; Compaan, A.D. Wavelength and Pulse Duration Effects in Laser Scribing of Thin Films. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 491-494. Work performed by University of Toledo, Toledo, Ohio.

McCandless, B.E.; Birkmire, R.W. $CdTe_{1-x}Sx$ Absorber Layers for Thin-Film CdTe/CdS Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 307-312. Work performed by University of Delaware, Newark, Delaware.

McConnell, R.D., ed. Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 24-26 March 1997, Denver, Colorado. AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; 448 pp.

McConnell, R.D.; Mazer, J.A. Role of Universities in the DOE National Photovoltaics Program. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 24-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 101-103.

McMahon, T.J.; von Roedern, B. Effect of Light Intensity on Current Collection in Thin-Film Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 375-378.

Meyer, G.J. Electron Transfer in Sensitized TiO_2 Photoelectrochemical Cells. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 137-143. Work performed by Johns Hopkins University, Baltimore, Maryland.

Mitchell, R.L.; Witt, C.E.; Thomas, H.P.; Ruby, D.S.; King, R.; Aldrich, C.C. Progress Update on the U.S. Photovoltaic Manufacturing Technology Project. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1073-1076.

Moore, J.T.; Wang, T.H.; Heben, M.J.; Douglas, K.; Ciszek, T.F. Fused-Salt Electrodeposition of Thin-Layer Silicon. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 775-778.

Moutinho, H.R.; Al-Jassim, M.M.; Abulfotuh, F.A.; Levi, D.H.; Dippo, P.C.; Dhere, R.G.; Kazmerski, L.L. Studies of Recrystallization of CdTe Thin Films After $CdCl_2$ Treatment. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 431-434.

Moutinho, H.R.; Al-Jassim, M.M.; Levi, D.H.; Dippo, P.C.; Kazmerski, L.L. Effects of $CdCl_2$ Treatment on the Recrystallization and Electro-Optical Properties of CdTe Thin Films. *Journal of Vacuum Science and Technology. A, Vacuum, Surfaces, and Films.* May/June 1998; 16(3): pp. 1251-1257.

Mueller, C.H.; Galt, D.; Treece, R.E.; Rivkin, T.V.; Webb, J.D.; Moutinho, H.R.; Dalberth, M.; Rogers, C.T. Infrared Characterization of $SrTiO_3$ Thin Films Using Attenuated Total Reflectance. *IEEE Transactions on Applied Superconductivity.* June 1997; 7(2): pp. 1628-1631.

Mueller, C.H.; Treece, R.E.; Rivkin, T.V.; Miranda, F.A.; Moutinho, H.R.; Swartzlander-Franz, A.; Dalberth, M.; Rogers, C.T. Tunable $SrTiO_3$ Varactors Using Parallel Plate and Interdigital Structures. *IEEE Transactions on Applied Superconductivity.* June 1997; 7(2): pp. 3512-3515.

Muljadi, E. PV Water Pumping with a Peak-Power Tracker Using a Simple Six-Step Square-Wave Inverter. *IEEE Transactions on Industry Applications.* May/June 1997; 33(3): pp. 714-721.

Narasimha, S.; Rohatgi, A. Optimized Aluminum Back Surface Field Techniques for Silicon Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 63-66. Work performed by Georgia Institute of Technology, Atlanta, Georgia.

Nelson, A.J.; Levi, D. Novel Method for Growing CdS on CdTe Surfaces for Passivation of Surface States and Heterojunction Formation. *Journal of Vacuum Science and Technology. A, Vacuum, Surfaces, and Films.* May/June 1997; 15(3): pp. 1119-1123.

Niles, D.W.; Ramanathan, K.; Granata, J.; Hasoon, F.; Noufi, R.; Tielsch, B.J.; Fulghum, J.E. Na Impurity Chemistry in Photovoltaic CIGS Thin-Films: An Investigation with Photo- and Auger Electron Spectroscopies. Jones, E.D., et al., eds. *Thin-Film Structures for Photovoltaics: Proceedings of the Materials Research Society Symposium, 2-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 485: pp. 179-184.

Niles, D.W.; Ramanathan, K.; Hasoon, F.; Noufi, R.; Tielsch, B.J.; Fulghum, J.E. Na Impurity Chemistry in Photovoltaic CIGS Thin Films: An Investigation with X-ray Photoelectron Spectroscopy. *Journal of Vacuum Science and Technology. A, Vacuum, Surfaces, and Films.* November/December 1997; 15(6): pp. 3044-3049.

Nurdjaja, I.; Schiff, E.A. Photocapacitance and Hole Drift Mobility Measurements in Hydrogenated Amorphous Silicon (a-Si:H). Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 723-728. Work performed by Syracuse University, Syracuse, New York.

Olsen, L.C.; Lei, W.; Addis, F.W.; Shafarman, W.N.; Contreras, M.A.; Ramanathan, K. High-Efficiency CIGS and CIS Cells with CVD ZnO Buffer Layers. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 363-366.

Olson, J.M.; Kurtz, S.R.; Friedman, D.J.; Bertness, K. High-Efficiency, Multijunction GaInP/GaAs Solar Cells. Shur, M.S.; Suris, R.A., eds. *Compound Semiconductors 1996: Proceedings of the Twenty-Third International Symposium on Compound Semiconductors, 23-37 September 1996, St. Petersburg, Russia.* Institute of Physics Conference Series No. 155. Bristol, UK: Institute of Physics Publishing, 1997; pp. 419-424.

O'Regan, B.; Schwartz, D.T. Solid-State Photoelectrochemical Cells Based on Dye Sensitization. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 129-136. Work performed by University of Washington, Seattle, Washington.

Osterwald, C.R.; Anevsky, S.; Barua, A.K.; Chaudhuri, P.; Dubard, J.; Emery, K.; Hansen, B.; King, D.; Metzdorf, J.; Nagamine, F.; Shimokawa, R.; Wang, Y.X.; Wittchen, T.; Zaaiman, W.; Zastrow, A.; Zhang, J. World Photovoltaic Scale: An International Reference Cell Calibration Program. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1209-1212.

Perez, R.; Wenger, H.; Herig, C. Valuation of Demand-Side Commercial PV Systems in the United States. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 219-224.

Perkins, J.D.; Fu, M.L.; Trickett, D.M.; McGraw, J.M.; Ciszek, T.F.; Parilla, P.A.; Rogers, C.T.; Ginley, D.S. Raman Scattering in $LiCoO_2$ Single Crystals and Thin Films. Ginley, D.S., et al., eds. *Materials for Electrochemical Energy Storage and Conversion II—Batteries, Capacitors and Fuel Cells: Proceedings of the Materials Research Society Symposium, 1-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 496: pp. 329-334.

Pern, F.J. Ethylene-Vinyl Acetate (EVA) Encapsulants for Photovoltaic Modules: Degradation and Discoloration Mechanisms and Formulation Modifications for Improved Photostability. *Die Angewandte Makromolekulare Chemie. Papers presented at the Nineteenth Annual International Conference on Advances in the Stabilization and Degradation of Polymers, 9-11 June 1997, Luzern, Switzerland.* December 1997; Vol. 252: pp. 195-216.

Petkov, M.P.; Marek, T.; Asoka-Kumar, P.; Lynn, K.G.; Crandall, R.S.; Mahan, A.H. Investigation of Hydrogenized Amorphous Si Structures with Doppler Broadening Positron Annihilation Techniques. *Applied Physics Letters.* 6 July 1998; 73(1): pp. 99-101.

Philips, J.E.; Titus, J.; Hofman, D. Determining the Voltage Dependence of the Light-Generated Current in $CuInSe_2$-Based Solar Cells Using I-V Measurements Made at Different Light Intensities. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 463-466. Work performed by University of Delaware, Newark, Delaware.

Ramanathan, K.; Bhattacharya, R.N.; Granata, J.; Webb, J.; Niles, D.; Contreras, M.A.; Wiesner, H.; Hanson, F.S.; Noufi, R. Advances in the CIS Research at NREL. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 319-322.

Ramanathan, K.; Noufi, R.; Granata, J.; Webb, J.; Keane, J. Prospects for In Situ Junction Formation in $CuInSe_2$-Based Solar Cells. *Solar Energy Materials and Solar Cells.* 1998; 55: pp. 15-22.

Ramanathan, K.; Wiesner, H.; Asher, S.; Niles, D.; Webb, J.; Keane, J.; Noufi, R. Study of the $CdS/CuIn(Ga)Se_2$ Interface in Thin Film Solar Cells. Jones, E.D., et al., eds. *Thin-Film Structures for Photovoltaics: Proceedings of the Materials Research Society Symposium, 2-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 485: pp. 121-126.

Rand, J.A.; Bai, Y.; Checchi, J.C.; Culik, J.S.; Ford, D.H.; Kendall, C.L.; Sims, P.E.; Hall, R.B.; Barnett, A.M. Large-Area Silicon-Film™ Manufacturing under the PVMaT Program. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1169-1172. Work performed by AstroPower, Inc., Newark, Delaware.

Remes, Z.; Vanecek, M.; Mahan, A.H.; Crandall, R.S. Silicon Network Relaxation in Amorphous Hydrogenated Silicon. *Physical Review. B, Condensed Matter.* 15 November 1997—II; 56(20): pp. R12,710-R12,713.

Remes, Z.; Vanecek, M.; Torres, P.; Kroll, U.; Mahan, A.H.; Crandall, R.S. Optical Determination of the Mass Density of Amorphous and Microcrystalline Silicon Layers with Different Hydrogen Contents. *Journal of Non-Crystalline Solids.* 1998; Vols. 227-230: pp. 876-879.

Riker, G.M.; Al-Jassim, M.M.; Hasoon, F.S. Characterization of Chemical-Bath-Deposited CdS on Single Crystal InP Substrates. Jones, E.D., et al., eds. *Thin-Film Structures for Photovoltaics: Proceedings of the Materials Research Society Symposium, 2-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 485: pp. 285-290.

Rockett, A.; Birkmire, R.; Morel, D.; Fonash, S.; Hou, J.Y.; Marudachalam, M.; D'Amico, J.; Panse, P.; Zafar, S.; Schroeder, D.J. Next Generation CIGS for Solar Cells. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 403-410. Work performed by University of Illinois, University of Delaware, University of South Florida, and University of Pennsylvania.

Rosenwaks, Y.; Li, X.; Coutts, T.J. Characterization of Heat-Treated ITO/InP Solar Cells. *Journal of Vacuum Science and Technology. A, Vacuum, Surfaces, and Films.* July/August 1997; 15(4): pp. 2354-2358.

Schlichthorl, G.; Huang, S.Y.; Sprague, J.; Frank, A.J. Band Edge Movement and Recombination Kinetics in Dye-Sensitized Nanocrystalline TiO_2 Solar Cells: A Study by Intensity Modulated Photovoltage Spectroscopy. *Journal of Physical Chemistry B.* 1997; 101(41): pp. 8141-8155.

Schultz, N.; Vardeny, Z.V.; Taylor, P.C. Spin Dependent Photoinduced Absorption in A-Si:H. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 179-183. Work performed by University of Utah, Salt Lake City, Utah.

Schulz, D.L.; Curtis, C.J.; Cram, A.; Alleman, J.L.; Mason, A.; Matson, R.J.; Perkins, J.D.; Ginley, D.S. CIGS Films via Nanoparticle Spray Deposition: Attempts at Densifying a Porous Precursor. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 483-486.

Schulz, D.L.; Curtis, C.J.; Flitton, R.A.; Wiesner, H.; Keane, J.; Matson, R.J.; Jones, K.M.; Parilla, P.A.; Noufi, R.; Ginley, D.S. Cu-In-Ga-Se Nanoparticle Colloids as Spray Deposition Precursors for $Cu(In,Ga)Se_2$ Solar Cell Materials. *Journal of Electronic Materials.* May 1998; 27(5): pp. 433-437.

Shafarman, W.N.; Birkmire, R.W.; Marsillac, S.; Marudachalam, M.; Orbey, N.; Russell, R.W.F. Effect of Reduced Deposition Temperature, Time, and Thickness on $Cu(InGa)Se_2$ Films and Devices. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 331-334. Work performed by University of Delaware, Newark, Delaware.

Sites, J.R.; Granata, J.E.; Hiltner, J.F. Losses Due to Polycrystallinity in Thin-Film Solar Cells. *Solar Energy Materials and Solar Cells.* 1998; Vol. 55: pp. 43-50. Work performed by Colorado State University, Fort Collins, Colorado.

Sites, J.; Rand, J.; Kazmerski, L.L.; Phillips, J.E. Device and Materials Characterization in Manufacturing. *Progress in Photovoltaics: Research and Applications.* Papers from the 25th Anniversary Symposium of the Institute of Energy Conversion, 1-2 May 1997, Newark, Delaware. September/October 1998; 5(5): pp. 371-378.

Sopori, B. Optics Software Models Photovoltaic Light Trapping. *Laser Focus World.* February 1998; 34(2): pp. 159-161.

Sopori, B.L. Using Photonic Effects in Optical Processing for Silicon Device Fabrication. Ravindra, N.M.; Singh, R.K., eds. *Transient Thermal Processing Techniques in Electronic Materials.* Proceedings of a Symposium sponsored by the Thin Films & Interfaces Committee of the Electronic, Magnetic and Photonic Materials Division of TMS, 4-8 February 1996, Anaheim, California. Warrendale, PA: the Minerals, Metals and Materials Society, 1996; pp. 17-20.

Sopori, B.L.; Chen, W.; Alleman, J.; Matson R.; Ravinda, N.M.; Tan, T.Y. Grain Enhancement of Polycrystalline Silicon Films Aided by Optical Excitation. Jones, E.D., et al., eds. *Thin-Film Structures for Photovoltaics: Proceedings of the Materials Research Society Symposium, 2-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 485: pp. 95-100.

Sopori, B.L.; Chen, W.; Madjdpour, J.; Symko, M. Thin-Film Silicon Solar Cell: Design and Processing Approach. Jones, E.D., et al., eds. *Thin-Film Structures for Photovoltaics: Proceedings of the Materials Research Society Symposium, 2-5 December 1997, Boston, Massachusetts.* Warrendale, PA: Materials Research Society, 1998; Vol. 485: pp. 101-106.

Sopori, B.L.; Madjdpour, J.; von Roedern, B.; Chen, W.; Hegedus, S.S. Optical Losses in Amorphous Silicon Solar Cells due to Back Reflectors. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 777-782.

Sopori, B.; Symko, M.I.; Reedy, R.; Jones, K.; Matson, R. Mechanism(s) of Hydrogen Diffusion in Silicon Solar Cells During Forming Gas Anneal. Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California. New York: Institute of Electrical and Electronics Engineers, 1997; pp. 25-30.

Stanbery, B.J.; Lambers, E.S.; Anderson, T.J. XPS Studies of Sodium Compound Formation and Surface Segregation in CIGS Thin Films. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 499-502. Work performed by University of Florida, Gainesville, Florida.

Starrs, T.; Wenger, H.; Brooks, B.; Herig, C. Barriers and Solutions for Connecting PV to the Grid. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 205-210.

Stephen, J.T.; Rutland, J.M.; Han, D.; Wu, Y. NMR Investigation of H Cluster Configurations in a-Si:H. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 159-164. Work performed by University of North Carolina, Chapel Hill, North Carolina.

Stone, J.L.; Ullal, H.S.; Sastry, E.V.R. Indo-U.S. Cooperative Photovoltaic Project. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1273-1275.

Sugiyama, S.; Yang, J.; Guha, S. Improved Stability Against Light-Exposure in Deuterated Amorphous Silicon Alloy Solar Cells. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 49-54. Work performed by United Solar Systems Corporation, Troy, Michigan.

Sundaram, V.S.; Saban, S.B.; Morgan, M.D.; Horne, W.E.; Evans, B.D.; Ketterl, J.R.; Morosini, M.B.Z.; Patel, N.B.; Field, H. GaSb-Based Ternary and Quaternary Diffused Junction Devices for TPV Applications. Coutts, T.J.; Allman, C.S.; Benner, J.P., eds. *Thermophotovoltaic Generation of Electricity: Third NREL Conference, May 1997, Colorado Springs, Colorado.* AIP Conference Proceedings No. 401. Woodbury, NY: American Institute of Physics, 1997; pp. 105-115.

Surek, T. Progress in Photovoltaics: From the Laboratory to the Marketplace. *Proceedings of the Twenty-First DOE Solar Photochemistry Research Conference, 7-11 June 1997, Copper Mountain, Colorado.* NREL/CP-520-22968. 1997; p. 21.

Tang, J.; Mao, D.; Ohno, T.R.; Kaydanov, V.; Trefny, J.U. Properties of ZnTe:Cu Thin Films and CdS/CdTe/ZnTe Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 439-442. Work performed by Colorado School of Mines, Golden, Colorado.

Thornton, J.P.; Thornton, S.M. Engineers in the Mist: The Solar in the Jungle Project. *Solar Today.* May/June 1997; 11(3): pp. 20-23.

Tuttle, J.R.; Cole, E.D.; Berens, T.A.; Alleman, J.; Keane, J. Thin-Film Filament-Based Solar Cells and Modules. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 243-250.

Ullal, H.S.; Zweibel, K.; von Roedern, B.G. Current Status of Polycrystalline Thin-Film PV Technologies. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 301-305.

Unold, T.; Mahan, A.H. ESR Studies on Hot-Wire Amorphous Silicon. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 663-668.

Unold, T.; Reedy, R.C.; Mahan, A.H. Defects in Hot-Wire Deposited Amorphous Silicon: Results from Electron Spin Resonance. *Journal of Non-Crystalline Solids.* 1998; Vols. 227-230: pp. 362-366.

Venkatasubramanian, R.; O'Quinn, B.C.; Siivola, E.; Keyes, B.; Ahrenkiel, R. 20% (AM1.5) Efficiency GaAs Solar Cells on Sub-mm Grain-Size Poly-Ge and its Transition to Low-Cost Substrates. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 811-814. Work performed by Research Triangle Institute, Research Triangle Park, North Carolina.

Venkatasubramanian, R.; Siivola, E.; O'Quinn, B.; Keyes, B.; Ahrenkiel, R. Pathways to High-Efficiency GaAs Solar Cells on Low-Cost Substrates. McConnell, R.D., ed. *Future Generation Photovoltaic Technologies: Proceedings of the First NREL Conference, 22-26 March 1997, Denver, Colorado.* AIP Conference Proceedings No. 404. Woodbury, NY: American Institute of Physics, 1997; pp. 411-418.

von Roedern, B.; Schiff, E.; Cohen, J.D.; Wagner, S.; Hegedus, S.S. Summary of 4-1/2 Years of Research Experience of the U.S. Amorphous Silicon Research Teams. *Progress in Photovoltaics: Research and Applications.* Papers from the 25th Anniversary Symposium of the Institute of Energy Conversion, 1-2 May 1997, Newark, Delaware. September/October 1997;

5(5): pp. 345-352. Work performed by the National Renewable Energy Laboratory, Golden, Colorado; Department of Physics, Syracuse University, Syracuse, New York; Department of Physics, University of Oregon, Eugene, Oregon; Department of Electrical Engineering, Princeton University, Princeton, New Jersey; and Institute of Energy Conversion, University of Delaware, Newark, Delaware.

Wallace, W.L.; Tsuo, Y.S. Photovoltaics for Rural Electrification in the People's Republic of China. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1277-1280.

Wang, Q.; Crandall, R.S.; Han, D. Effects of Hydrogen Dilution on V_{oc} in a-Si:H pin Solar Cells. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 753-758.

Wangensteen, T.L.; Wanlass, M.W.; Carapella, J.J.; Moutinho, H.R.; Mason, A.R.; Webb, J.D.; Abulfotuh, F.A. Optical Characterization of Epitaxial $Ga_xIn_{1-x}As$ Suitable for Thermophotovoltaic (TPV) Converters. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 967-970.

Ward, J.S.; Duda, A.; Wanlass, M.W.; Carapella, J.J.; Wu, X.; Matson, R.J.; Coutts, T.J.; Moriarty, T.; Murray, C.S.; Riley, D.R. Novel Design for Monolithic Interconnected Modules (MIMS) for Thermophotovoltaic Power Conversion. Coutts, T.J.; Allman, C.S.; Benner, J.P., eds. *Thermophotovoltaic Generation of Electricity: Third NREL Conference, May 1997, Colorado Springs, Colorado.* AIP Conference Proceedings No. 401. Woodbury, NY: American Institute of Physics, 1997; pp. 227-236.

Webb, J.D.; Rose, D.H.; Niles, D.W.; Swartzlander, A.; Al-Jassim, M.M. FTIR, EPMA, Auger, and XPS Analysis of Impurity Precipitates in CdS Films. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 399-402.

Wickboldt, P.; Pang, D.; Paul, W.; | Chen, J.H.; Chen, C.C.; Cohen, J.D. Ambipolar Phototransport (*e = *h) Observed as an Intrinsic Property of a-SiGe:H. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 263-268. Work performed by Harvard University, Cambridge, Massachusetts; Boston College, Boston, Massachusetts; University of Oregon, Eugene, Oregon; and Lawrence Livermore National Laboratory, Livermore, California.

Wohlgemuth, J.H.; Whitehouse, D.; Koval, T.; Creager, J.; Artigliere, F.; Tomlinson, T.; Cliber, J.; Buckman, A.; Perry, M.; Narayanan, S.; Shea, S.; Roy, M.; Kelly, G.; Brisson, M.; Dominguez, R.; Conway, M. Progress in Solarex's Crystalline Silicon PVMaT Program. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 1055-1060. Work performed by Solarex Corporation, Frederick, Maryland.

Wronski, C.R.; Lu, Z.; Jiao, L.; Lee, Y. Approach to Self-Consistent Analysis of a-Si:H Material and p-i-n Solar Cell Properties. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 587-590. Work performed by Pennsylvania State University, University Park, Pennsylvania.

Wu, X.; Coutts, T.J.; Mulligan, W.P. Properties of Transparent Conducting Oxides Formed from CdO and ZnO Alloyed with SnO_2 and In_2O_3. *Journal of Vacuum Science and Technology. A, Vacuum, Surfaces, and Films.* May/June 1997; 15(3): pp. 1057-1062.

Wu, X.; Sheldon, P.; Coutts. T. J.; Rose, D.H.; Moutinho, H.R. Application of Cd_2SnO_4 Transparent Conducting Oxides in CdS/CdTe Thin-Film Devices. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 347-350.

Yan, B.; Taylor, P.C. Electron Spin Resonance of Hydrogenated Amorphous Silicon Alloyed with Sulfur. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 103-108. Work performed by University of Utah, Salt Lake City, Utah.

Yang, J.; Banerjee, A.; Glatfelter, T.; Sugiyama, S.; Guha, S. Recent Progress in Amorphous Silicon Alloy Leading to 13% Stable Cell Efficiency. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 563-568. Work performed by United Solar Systems Corporation, Troy, Michigan.

Yang, J.; Baneerjee, A.; Guha, S. Amorphous Silicon Alloy Triple-Junction Solar Cell with 14.6% Initial and 13.0% Stable Efficiencies. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 693-698. Work performed by United Solar Systems Corporation, Troy, Michigan.

Yoon, J.H.; Taylor, P.C.; Yan, B.; Lee, C.H. Light-Induced Effects in a-Si:H Films Alloyed with Sulfur. Wagner, S., et al., eds. *Amorphous and Microcrystalline Silicon Technology 1997: Proceedings of the Materials Research Society Symposium, 31 March-4 April 1997, San Francisco, California.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 467: pp. 97-102. Work performed by University of Utah, Salt Lake City, Utah, and College of Natural Sciences, Chunchon, Korea.

Zafar, S.; Sankaranarayana, H.; Jayapalan, A.; Narayanaswamy, R.; Ferekides, C.S.; Morel, D.L. Use of Ga in Two-Step Processing to Optimize the Electronic Properties of $CuIn_xGa_{1-x}Se_2$ Solar Cells. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 379-382. Work performed by University of South Florida, Tampa, Florida.

Zhang, J.G.; McGraw, J.M.; Turner, J.; Ginley, D. Charging Capacity and Cycling Stability of VO_x Films Prepared by Pulsed Laser Deposition. *Journal of the Electrochemical Society.* May 1997; 144(5): pp. 1630-1634.

Solar Energy—Radiation

Cannon, T.W. Light and Radiation, Chapter 1. DeCusatis, C., ed. *Handbook of Applied Photometry.* New York: Optical Society of America and Springer-Verlag, 1998; pp. 1-31.

Lewandowski, A.; Bingham, C.; Shatz, N.; Bortz, J.C. Performance Validation of an Irradiance Redistribution Guide. *Nonimaging Optics: Maximum Efficiency Light Transfer IV; Proceedings of the SPIE Annual Meeting, 27-28 July 1997, San Diego, California.* Bellingham, WA: Society of Photo-optical Instrumentation Engineers, 1997; Vol. 3139: pp. 225-236.

Marion, B. Multi-Pyranometer Array Design and Performance Summary. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 523-528.

Maxwell, E.L. METSTAT: The Solar Radiation Model Used in the Production of the National Solar Radiation Data Base (NSRDB). *Solar Energy.* 1998; 62(4): pp. 263-279.

Maxwell, E.L.; George, R.L.; Wilcox, S.M. Climatological Solar Radiation Model. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 505-510.

Meyers, S.; Sathaye, J.; Goldberg, B.; Renne, D.; Kaupp, A.; Mendis, M.; Ernst, J.; Kokorin, A.; Kerr, T. International Workshop on Greenhouse Gas Mitigation Technologies and Measures: Summary. *Applied Energy.* 1996; 56(3/4): pp. 203-223.

Michalsky, J.; Rubes, M.; Stoffel, T.; Wesely, M.; Splitt, M.; DeLuisi, J. Optimal Measurement of Surface Shortwave Irradiance Using Current Instrumentation—The ARM Experience. 1997; 8 pp. ANL/ER/CP-91459. Available from NTIS. Extended abstract for the Preprint Volume of the Ninth Conference on Atmospheric Radiation, 2-7 February 1997, Long Beach, California.

Tyson, K.S.; Nelson, R.; Thangavadivelu, S.; Lightle, D.; Stover, S. Crop Residue Assessment Methodology. *Bioenergy '96—Partnerships to Develop and Apply Biomass Technologies: Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee.* Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. I: pp. 472-479.

Ugoretz, S.M.; Rineer, K.C. Ecological Research Priorities for Energy Crops in the North Central States. *Bioenergy '96—Partnerships to Develop and Apply Biomass Technologies: Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee.* Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. I: 225-232. Work performed by Wisconsin Department of Natural Resources, Madison, Wisconsin, and the Public Service Commission of Wisconsin, Madison, Wisconsin.

Vignola, F.; Reda, I. Responsivity of an Eppley NIP as a Function of Time and Temperature. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 517-522.

Solar Energy—Thermal

Bohn, M.S. Application of Radiant Burner Technology to Hybrid Dish/Stirling Systems. Claridge, D.E.; Pacheco, J.E., eds. *Solar Engineering 1997: Proceedings of the International Solar Energy Conference, 27-30 April 1997, Washington, DC.* New York: American Society of Mechanical Engineers, 1997; pp. 87-92.

Brown, H.; Hewett, R.; Walker, A.; Gee, R.; May, K. Performance Contracting for Parabolic Trough Solar Thermal Systems. *Energy Engineering.* 1997; 94(6): pp. 33-44.

Burch, J.D.; Thomas, K.E. Solar Thermal Water Pasteurization. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 389-393.

Cable, R.G.; Cohen, G.E.; Kearney, D.W.; Price, H.W. SEGS Plant Performance 1989-1997. Morehouse, J.M.; Hogan, R.E., eds. *Solar Engineering.* Proceedings of the International Solar Energy Conference, 14-17 June 1998, Albuquerque, New Mexico. New York: American Society of Mechanical Engineers, 1998; pp. 445-452.

Christensen, C.; Barker, G. Annual System Efficiencies for Solar Water Heating. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 291-296.

Hale, M.J. Solar Process Heat (White paper). McIntyre, M., ed. *Solar Energy: Today's Technologies for a Sustainable Future.* Boulder, CO: American Solar Energy Society, August 1997; Chap. 5: p. 55.

Hassani, A.V.; Kirkpatrick, A.; Sforza, P.M. Flow and Separation Characteristics of Three-Dimensional Negatively Buoyant Wall Jets. *HVAC&R Research.* April 1997; 3(2): pp. 112-127.

Jones, S.A.; Gruetzner, J.K.; Houser, R.M.; Edgar, R.M.; Wendelin, T.J. VSHOT Measurement Uncertainty and Experimental Sensitivity Study. *IECEC-97: Proceedings of the Thirty-Second Intersociety Energy Conversion Engineering Conference, 27 July-1 August 1997, Honolulu, Hawaii.* New York: American Institute of Chemical Engineers, 1997; Vol. 3: pp. 1877-1882.

Markham, J.R.; Cosgrove, J.E.; Nelson, C.M.; Bonanno, A.S.; Schlief, R.E.; Stoy, M.A.; Glatzmaier, G.C.; Bingham, C.E.; Lewandowski, A.A. In-Situ FT-IR Monitoring of a Solar Flux Induced Chemical Process. *Journal of Solar Energy Engineering.* August 1997; 19(3): pp. 219-224.

O'Gallagher, J.J.; Winston, R. Simple Economic Model for Solar Cooling and the Potential for the ICPC Collector. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 401-406. Work performed by University of Chicago, Chicago, Illinois.

Raudales, R.; Villanueva, D.; Munger, C.; Duffy, J. Solar Coffee Dryers. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 427-430. Work performed by Mesoamerican Development Institute, Lowell, Massachusetts, and University of Massachusetts, Lowell, Massachusetts.

Vliet, G.; Baker, D. Designing Solar Hot Water Systems for Scaling Environments. Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 307-312. Work performed by University of Texas, Austin, Texas.

Williams, T. Solar Thermal (White paper). McIntyre, M., ed. *Solar Energy: Today's Technologies for a Sustainable Future.* Boulder, CO: American Solar Energy Society, August 1997; Chap. 2: pp. 26-29.

Winston, R.; O'Gallagher, J.J.; Mahoney, A.R.; Dudley, V.E.; Hoffman, R. Initial Performance Measurements from a Low Concentration Version of an Integrated Compound Parabolic Concentrator (ICPC). Campbell-Howe, R.; Cortez, T.; Wilkins-Crowder, B., eds. *Proceedings of the 1998 American Solar Energy Society Annual Conference, 14-17 June 1998, Albuquerque, New Mexico.* Boulder, CO: American Solar Energy Society, 1998; pp. 369-374. Work performed by University of Chicago, Chicago, Illinois; Sandia National Laboratories, Albuquerque, New Mexico; and Midway Laboratories, Chicago, Illinois.

Solid State Theory

Bellaiche, L.; Wei, S.H.; Zunger, A. Band Gaps of GaPN and GaAsN Alloys. *Applied Physics Letters.* 30 June 1997; 70(26): pp. 3558-3560.

Bellaiche, L.; Wei, S.H.; Zunger, A. Bond-Length Distribution in Tetrahedral versus Octahedral Semiconductor Alloys: The Case of $Ga_{1-x}In_xN$. *Physical Review. B, Condensed Matter.* 1 December 1997—I; 56(21): pp. 13,872-13,877.

Bellaiche, L.; Wei, S.H.; Zunger, A. Composition Dependence of Interband Transition Intensities in GaPN, GaAsN, and GaPAs Alloys. *Physical Review. B, Condensed Matter.* 15 October 1997—II; 56(16): pp. 10,233-10,240.

Bellaiche, L.; Zunger, A. Effects of Atomic Short-Range Order on the Electronic Structure of GaAsN, GaInN, and GaInAs Alloys. *Physical Review. B, Condensed Matter.* 15 February 1998—II; 57(8): pp. 4425-4431.

Ferreira, L.G.; Wolverton, C.; Zunger, A. Evaluating and Improving the Cluster Variation Method Entropy Functional for Ising Alloys. *Journal of Chemical Physics.* 15 February 1998; 108(7): pp. 2912-2918.

Fu, H.; Wang, L.W.; Zunger, A. Applicability of the k.p Method to the Electronic Structure of Quantum Dots. *Physical Review. B, Condensed Matter.* 15 April 1998—II; 57(16): pp. 9971-9987.

Fu, H.; Wang, L.W.; Zunger, A. Comparison of the k.p and the Direct Diagonalization Approaches for Describing the Electronic Structure of Quantum Dots. *Applied Physics Letters.* 8 December 1997; 71(23): pp. 3433-3435.

Fu, H.; Zunger, A.Excitons in InP Quantum Dots. *Physical Review. B, Condensed Matter.* 15 June 1998—II; 57(24): pp. R15,064-R15,067.

Fu, H.; Zunger, A. Quantum Size Effects on the Pressure-Induced Direct-to-Indirect Band-Gap Transition in InP Quantum Dots. *Physical Review Letters.* 15 June 1998; 80(24): pp. 5397-5400.

Kim, J.; Wang, L.W.; Zunger, A. Comparison of the Electronic Structure of InAs/GaAs Pyramidal Quantum Dots with Different Facet Orientations. *Physical Review. B, Condensed Matter.* 15 April 1998—II; 57(16): pp. R9408-R9411.

Kim, J.; Wang, L.W.; Zunger, A. Prediction of Charge Separation in GaAs/AlAs Cylindrical Nanostructures. *Physical Review. B, Condensed Matter.* 15 December 1997—II; 56(24): pp. R15,541-R15,544.

Mattila, T.; Bellaiche, L.; Wang, L.W.; Zunger, A.Electronic Structure Induced by Lateral Composition Modulation in GaInAs Alloys. *Applied Physics Letters.* 27 April 1998; 72(17): pp. 2144-2146.

Mattila, T.; Zunger, A.Deep Electronic Gap Levels Induced by Isovalent P and As Impurities in GaN. *Physical Review. B, Condensed Matter.* 15 July 1998—I; 58(3): pp. 1367-1373.

Ozolins, V.; Wolverton, C.; Zunger, A. Cu-Au, Ag-Au, Cu-Ag, and Ni-Au Intermetallics: First-Principles Study of Temperature-Composition Phase Diagrams and Structures. *Physical Review. B, Condensed Matter.* 15 March 1998—I; 57(11): pp. 6427-6443.

Ozolins, V.; Wolverton, C.; Zunger, A. Effects of Anharmonic Strain on the Phase Stability of Epitaxial Films and Superlattices: Applications to Noble Metals. *Physical Review. B, Condensed Matter.* 2 February 1998—II; 57(8): pp. 4816-4828.

Ozolins, V.; Wolverton, C.; Zunger, A. First-Principles Theory of Vibrational Effects on the Phase Stability of Cu-Au Compounds and Alloys. *Physical Review. B, Condensed Matter.* 1 September 1998—II; 58(10): pp. R5897-R5900.

Ozolins, V.; Wolverton, C.; Zunger, A. Strain-Induced Change in the Elastically Soft Direction of Epitaxially Grown Face-Centered-Cubic Metals. *Applied Physics Letters.* 26 January 1998; 72(4): pp. 427-429.

Ozolins, V.; Zunger, A. First-Principles Theory of the Evolution of Vibrational Properties with Long-Range Order in $GaInP_2$. *Physical Review. B, Condensed Matter.* 15 April 1998—II; 57(16): pp. R9404-R9407.

Pryor, C.; Kim, J.; Wang, L.W.; Williamson, A.J.; Zunger, A. Comparison of Two Methods for Describing the Strain Profiles in Quantum Dots. *Journal of Applied Physics.* 1 March 1998; 83(5): pp. 2548-2554.

Wang, L.W.; Bellaiche, L.; Wei, S.H.; Zunger, A. "Majority Representation" of Alloy Electronic States. *Physical Review Letters.* 25 May 1998; 80(21): pp. 4725-4728.

Wang, L.W.; Zunger, A. High-Energy Excitonic Transitions in CdSe Quantum Dots. *Journal of Physical Chemistry B.* 20 August 1998; 102(34): pp. 6449-6454.

Wang, L.W.; Zunger, A. Magnitude and Size Scaling of Intervalley Coupling in Semiconductor Alloys and Superlattices. *Physical Review. B, Condensed Matter.* 15 November 1997—I; 56(19): pp. 12,395-12,403.

Wei, S.H.; Zhang, S.B.; Zunger, A. Effects of Ga Addition to $CuInSe_2$ on Its Electronic, Structural, and Defect Properties. *Applied Physics Letters.* 15 June 1998; 72(24): pp. 3199-3201.

Wei, S.H.; Zhang, S.B.; Zunger, A. Why is Heavily-Defected $CuInSe_2$ a Good Opto-Electronic Material?: Defect Physics in $CuInSe_2$. Tomlinson, R.D.; Hill, A.E.; Pilkington, R.D., eds. *Ternary and Multinary Compounds: Proceedings of the 11th International Conference on Ternary and Multinary Compounds, ICTMC-11, 8-12 September 1997, Salford, Great Britain*. Institute of Physics Conference Series Number 152. Philadelphia, PA: Institute of Physics, 1998; pp. 765-771.

Wei, S.H.; Zunger, A. Point-Ion Versus Density Functional Calculations of Electric Field Gradients in Ordered $GaInP_2$. *Jounal of Chemical Physics.* 8 August 1997; 107(6): pp. 1931-1935.

Wei, S.H.; Zunger, A. Calculated Natural Band Offsets of All II-VI and III-V Semiconductors: Chemical Trends and the Role of Cation d Orbitals. *Applied Physics Letters.* 20 April 1998; 72(16): pp. 2011-2013.

Wei, S.H.; Zunger, A. Electronic and Structural Anomalies in Lead Chalcogenides. *Physical Review. B, Condensed Matter.* 15 May 1997—II; 55(20): pp. 13,605-13,610.

Wei, S.H.; Zunger, A.; Choi, I.H.; Yu, P.Y. Trends in Band-Gap Pressure Coefficients in Chalcopyrite Semiconductors. *Physical Review. B, Condensed Matter.* 15 July 1998—II; 58(4): pp. R1710- R1713.

Williamson, A.J.; Zunger, A. Effect of Interfacial States on the Binding Energies of Electrons and Holes in InAs/GaAs Quantum Dots. *Physical Review. B, Condensed Matter.* 15 September 1998—I; 58(11): pp. 6724-6727.

Williamson, A.J.; Zunger, A. Prediction of a Strain-Induced Conduction-Band Minimum in Embedded Quantum Dots. *Physical Review. B, Condensed Matter.* 15 February 1998—II; 57(8): pp. R4253-R4256.

Wolverton, C.; Ozolins, V.; Zunger, A. First-Principles Theory of Short-Range Order in Size-Mismatched Metal Alloys: Cu-Au, Cu-Ag, and Ni-Au. *Physical Review. B, Condensed Matter.* 15 February 1998—II; 57(8): pp. 4332-4348.

Wolverton, C.; Zunger, A. Cation and Vacancy Ordering in Li_xCoO_2. *Physical Review. B, Condensed Matter.* 15 January 1998—II; 57(4): pp. 2242-2252.

Wolverton, C.; Zunger, A. First-Principles Prediction of Vacancy Order-Disorder and Intercalation Battery Voltages in Li_xCoO_2. *Physical Review Letters.* 20 July 1998; 81(3): pp. 606-609.

Wolverton, C.; Zunger, A. First-Principles Theory of Cation and Intercalation Ordering in Li_xCoO_2. Ginley, D.S., et al., eds. *Materials for Electrochemical Energy Storage and Conversion II—Batteries, Capacitors and Fuel Cells: Proceedings of the Materials Research Society Symposium, 1-5 December 1997, Boston, Massachusetts*. Warrendale, PA: Materials Research Society, 1998; Vol. 496: pp. 77-88.

Wolverton, C.; Zunger, A. Ni-Au: A Testing Ground for Theories of Phase Stability. *Computational Materials Science.* Contains Proceedings of the Joint NSF/CNRS Workshop on Alloy Theory, 11-15 October 1996, Strasbourg, France. May 1997; 8(1-2): pp. 107-121.

Wolverton, C.; Zunger, A. Prediction of Li Intercalation and Battery Voltages in Layered vs. Cubic Li_xCoO_2. *Journal of the Electrochemical Society.* July 1998; 145(7): pp. 2424-2431.

Zhang, S.B.; Wei, S.H.; Zunger, A. Phenomenological Model for Systematization and Prediction of Doping Limits in II-VI and I-III-VI2 Compounds. *Journal of Applied Physics.* 15 March 1998; 83(6): pp. 3192-3196.

Zhang, S.B.; Wei, S.H.; Zunger, A.; Katayama-Yoshida, H. Defect Physics of the $CuInSe_2$ Chalcopyrite Semiconductor. *Physical Review. B, Condensed Matter.* 15 April 1998—II; 57(16): pp. 9642-9656.

Zunger, A.; Zhang, S.B.; Wei, S.H. Revisiting the Defect Physics in $CuInSe_2$ and $CuGaSe_2$. *Conference Record of the Twenty-Sixth IEEE Photovoltaic Specialists Conference, 29 September-3 October 1997, Anaheim, California.* New York: Institute of Electrical and Electronics Engineers, 1997; pp. 313-318. Preprint version available online at: *http://www.sst.nrel.gov/personnel/ozolins/ieee.pdf*

Superconductivity

Bhattacharya, R.N.; Batchelor, W.; Granata, J.E.; Hasoon, F.; Wiesner, H.; Ramanathan, K.; Keane, J.; Noufi, R.N. $CuIn_{1-x}GaxSe_2$-Based Photovoltaic Cells from Electrodeposited and Chemical Bath Deposited Precursors. *Solar Energy Materials and Solar Cells.* 1998; Vol. 55: pp. 83-94.

Blaugher, R.D. Low-Calorie, High-Energy Generators and Motors. *IEEE Spectrum.* July 1997; 34(7): pp. 36-42.

Natarajan, A.; Wang, W.; Ma, E.; Bhattacharya, R.N.; Khan-Malek, C.; Paranthaman, M.; Martin, P.M. Electrodeposition of High-T_c Superconductor Material for Microsensor Fabrication. Andricacos, P.C., et al., eds. *Electrochemical Synthesis and Modification of Materials: Proceedings of the Materials Research Society Symposium, 2-5 December 1996, Boston, Massachusetts.* Pittsburgh, PA: Materials Research Society, 1997; Vol. 451: pp. 401-406.

Parilla, P.A.; McGraw, J.M.; Schulz, D.L.; Wendelin, J.; Bhattacharya, R.N.; Blaugher, R.D.; Ginley, D.S.; Voigt, J.A.; Roth, E.P. Development of Buffer Layers for High Quality Tl-Pb-Sr-Ba-Ca-Cu-O Thick Films on Flexible Metal Substrates. *IEEE Transactions on Applied Superconductivity: Proceedings of the 1996 Applied Superconductivity Conference, 25-30 August 1996, Pittsburgh, Pennsylvania.* 2 June 1997; 7(2): pp. 1969-1972.

Schulz, D.L.; Marks, T.J. Superconducting Materials, Chapter 2. Rees, W.S., Jr., ed. *CVD of Nonmetals.* Weinheim, Germany: VCH, 1996; pp. 37-150.

Transportation

Bailey, B.; Eberhardt, J.; Goguen, S.; Erwin, J. Diethyl Ether (DEE) as a Renewable Diesel Fuel. *Alternative Fuels Technology and Developments.* Society of Automotive Engineers, Inc. SP-1298. Warrendale, PA: Society of Automotive Engineers, Inc., October 1997; pp. 97-103.

Utilities

Colvin, M.A. Alternative Financing Through Utility Programs for Federal Energy and Water Saving Projects, Chapter 26. Ricketts, J., ed. *Energy and Environmental Visions for the New Millennium.* Lilburn, GA: the Fairmont Press, Inc., 1998; pp. 219-224.

Velupillai, L.; Mahin, D.B. Markets for Rice Husk-to-Energy Systems and Equipment. *Bioenergy '96—Partnerships to Develop and Apply Biomass Technologies: Proceedings of the Seventh National Bioenergy Conference, 15-20 September 1996, Nashville, Tennessee.* Nashville, TN: Southeastern Regional Biomass Energy Program, 1996; Vol. I: pp. 171-178. Work performed by Louisiana State University, Baton Rouge, Louisiana, and International Energy Projects, Charlotte, North Carolina.

Water Recycling and Management

Blake, D.M.; Magrini-Bair, K.; Wolfrum, E.; May, E.K. Materials Issues in Solar Detoxification of Air and Water. Lampert, C.M., et al., eds. *Optical Materials Technology for Energy Efficiency and Solar Energy Conversion XV: Proceedings from the SPIE Annual Meeting, 28-29 July 1997, San Diego, California.* Bellingham, WA: Society of Photo-Optical Instrumentation Engineers, 1997; Vol. 3138: pp. 154-162.

Reinsch, V.E.; Kelley, S.S. Crystallization of Poly (hydroxy-butyrate-co-hydroxyvalerate) in Wood Fiber-Reinforced Composites. *Journal of Applied Polymer Science.* 31 May 1997; 64(9): pp. 1785-1796.

Wind Energy

Balas, M.J.; Lee, Y.J.; Kendall, L. Disturbance Tracking Control Theory with Application to Horizontal-Axis Wind Turbines. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 95-99. Work performed by University of Colorado, Boulder, Colorado.

Berg, D.E.; Rumsey, M.; Robertson, P.; Kelley, N.; McKenna, E.; Gass, K. Development of a Light-Weight, Wind-Turbine-Rotor-Based Data Acquisition System. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 238-249.

Devgan, S.S.; Bodruzzaman, M. Development of a Neural Network Predictor for Wind Power. *Energy Business Technology Sourcebook: Proceedings of the 19th World Energy Engineering Congress, 6-8 November 1996, Atlanta, Georgia.* 1997; Chap. 37: pp. 297-302. Work performed by Tennessee State University, Nashville, Tennessee.

Du, Z.; Selig, M.S. 3-D Stall-Delay Model for Horizontal Axis Wind Turbine Performance Prediction. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 9-19.

Eggers, A.J.Jr; Ashley, H.; Chaney, K.; Rock, S.M.; Digumarthi, R. Effects of Couples Rotor-Tower Motions on Aerodynamic Control of Fluctuating Loads on Light-Weight HAWTS. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 113-122. Work performed by RANN, Inc., Palo Alto, California.

Fingersh, L.J.; Carlin, P.W. Results from the NREL Variable-Speed Test Bed. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 233-237.

Freeman, J.B.; Robinson, M.C. Algorithm Using Spherical Coordinates to Calculate Dynamic Pressure from 5-Hole Pressure Probe Data. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 70-74.

Hand, M.M.; Balas, M.J. Systematic Approach for PID Controller Design for Pitch-Regulated, Variable-Speed Wind Turbines. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 84-94.

Hariharan, S.A.; Devgan, S.S.; Field, T. Impact of Distributed Hybrid Wind Electric Power Conversion Systems on the Electric Distribution System. *Collection of the 1997 ASME Wind Energy Symposium Technical Papers Presented at the 35th AIAA Aerospace Sciences Meeting and Exhibit, 6-9 January 1997, Reno, Nevada.* Washington, DC: American Institute of Aeronautics and Astronautics, 1997; pp. 12-21. Work performed by Tennessee State University, Nashville, Tennessee, and Nashville Electric Service, Nashville, Tennessee.

Holley, W.E. Regression Model for Turbulence with Reference to Wind Turbine Classes Defined in IEC 1400-1. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 262-272.

Kendall, L.; Balas, M.J.; Lee, Y.J.; Fingersh, L.J. Application of Proportional-Integral and Disturbance Accommodating Control to Variable-Speed Variable-Pitch Horizontal-Axis Wind Turbines. *Wind Engineering.* 1997; 21(1): pp. 21-38.

McNiff, B.; LaWhite, N.; Muljadi, E. Characterizing Wind Turbine System Response to Lightning Activity: Preliminary Results. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 147-156.

Miller, A.; Muljadi, E.; Zinger, D.S. Variable-Speed Wind Turbine Power Control. *IEEE Transactions on Energy Conversion.* June 1997; 12(2): pp. 181-186.

Morrison, M.L.; Pollock, K.H.; Oberg, A.L.; Sinclair, K.C. Predicting the Response of Bird Populations to Wind Energy-Related Deaths. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 157-164.

Papadakis, M. Navier-Stokes Computations for an S809 Airfoil with Aerodynamic Control Devices. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 100-112. Work performed by Wichita State University, Wichita, Kansas.

Proceedings of National Avian-Wind Power Planning Meeting II, 20-22 September 1995, Palm Springs, California. Golden, CO: National Renewable Energy Laboratory, February 1998; 160 pp. Prepared for the Avian Subcommittee of the National Wind Coordinating Committee by RESOLVE, Inc., Washington, D.C., and LGL Ltd., Environment Research Associates, King City, Ontario.

Sutherland, H.J.; Carlin, P.W. Damage Measurements on the NWTC Direct-Drive, Variable-Speed Test Bed. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 315-322.

Tangler, J.L. Influence of Pitch, Twist, and Taper on a Blade's Performance Loss due to Roughness. *Journal of Solar Energy Engineering: Transactions of the American Society of Mechanical Engineers.* August 1997; Vol. 119: pp. 248-252.

Wright, A.D.; Kelley, N.D.; Bir, G.S. Analysis of a Two-Bladed Flexible Rotor System: Model Development Progress. *Collection of the 1998 ASME Wind Energy Symposium Technical Papers Presented at the 36th AIAA Aerospace Sciences Meeting and Exhibit, 12-15 January 1998, Reno, Nevada.* New York: American Institute of Aeronautics and Astronautics, Inc., and American Society of Mechanical Engineers, 1998; pp. 250-261.

Zinger, D.S.; Muljadi, E. Annualized Wind Energy Improvement Using Variable Speed. *IEEE Transactions on Industry Applications.* November/December 1997; 33(6): pp. 1444-1447.

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Patents

The following publications are U.S. patents issued for novel processes and inventions developed by NREL research staff. They are included to inform other technical professionals about new technologies. Copies of these patents are available through your local library. Unless otherwise indicated, the Midwest Research Institute, Kansas City, Missouri, is the assignee for all patents.

Alternative Fuels

Adney, W.S.; Thomas, S.R.; Baker, J.O.; Himmel, M.E.; Chou, Y.C., Inventors. Method for Increasing Thermostability in Cellulase Enzymes. U.S. Patent No. 5,712,142. January 27, 1998; 13 pp.

Picataggio, S.K.; Zhang, M.; Eddy, C.K.; Deanda, K.A., Inventors. Recombinant Zymomonas for Pentose Fermentation. U.S. Patent No. 5,726,053. March 10, 1998; 22 pp.

Picataggio, S.K.; Zhang, M.; Eddy, C.K.; Deanda, K.A.; Finkelstein, M.; Mohagheghi, A.; Newman, M.M.; McMillan, J.D., Inventors. Pentose Fermentation by Recombinant Zymomonas. U.S. Patent No. 5,712,133. January 27, 1998; 24 pp.

Picataggio, S.K.; Zhang, M.; Franden, M.A.; McMillan, J.D.; Finkelstein, M., Inventors. Recombinant Lactobacillus for Fermentation of Xylose to Lactic Acid and Lactate. U.S. Patent No. 5,798,237. August 25, 1998; 12 pp.

Rivard, C.J.; Nagle, N.J., Inventors. Pretreatment of High Solid Microbial Sludges. U.S. Patent No. 5,785,852. July 28, 1998; 5 pp.

Torget, R.W.; Kadam, K.L.; Philippidis, G.P.; Wyman, C.E., Inventors. Prehydrolysis of Lignocellulose. U.S. Patent No. 5,705,369. January 6, 1998; 21 pp.

Basic Sciences

Benson, D.K.; Bechinger, C.S.; Tracy, C.E., Inventors. Fiber Optic Device for Sensing the Presence of a Gas. U.S. Patent No. 5,708,735. January 13, 1998; 9 pp.

Zhang, J.G.; Benson, D.K.; Tracy, C.E., Inventors. Solid Lithium-Ion Electrolyte. U.S. Patent No. 5,716,736. February 10, 1998; 11 pp.

Chemical Technologies

Agblevor, F.A., Inventor. Process for Producing Phenolic Compounds from Lignins. U.S. Patent No. 5,807,952. September 15, 1998; 15 pp.

Black, S.K.; Hames, B.R.; Myers, M.D., Inventors. Method of Separating Lignocellulosic Material into Lignin, Cellulose and Dissolved Sugars. U.S. Patent No. 5,730,837. March 24, 1998; 4 pp.

Hydrogen

Tracy, C.E.; Keyser, M.A.; Benson, D.K., Inventors. Method for Charging a Hydrogen Getter. U.S. Patent No. 5,807,533. September 15, 1998; 18 pp.

Materials Science and Semiconductors

Bhattacharya, R.N.; Noufi, R.; Wang, L., Inventors. Production of Films and Powders for Semiconductor Device Applications. U.S. Patent No. 5,731,031. March 24, 1998; 7 pp.

Li, X.; Sheldon, P., Inventors. Variable Temperature Semiconductor Film Deposition. U.S. Patent No. 5,712,187. January 27, 1998; 5 pp.

Pehnt, M.; Schulz, D.L.; Curtis, C.J.; Ginley, D.S., Inventors. Preparation of a Semiconductor Thin Film. U.S. Patent No. 5,711,803. January 27, 1998; 3 pp.

Solar Energy—Photovoltaics

Ciszek, T.F., Inventor. Substrate for Thin Silicon Solar Cells. U.S. Patent No. 5,785,769. July 28, 1998; 6 pp.

Mahan, A.H.; Molenbrock, E.C.; Nelson, B.P., Inventors. Deposition of Device Quality, Low Hydrogen Content, Amorphous Silicon Films by Hot Filament Technique Using "Safe" Silicon Source Gas. U.S. Patent No. 5,776,819. July 7, 1998; 15 pp.

Muljadi, E.; Taylor, R.W., Inventors. Apparatus and Method for Maximizing Power Delivered by a Photovoltaic Array. U.S. Patent No. 5,747,967. May 5, 1998; 31 pp.

Sopori, B.L.; Allen, L.C.; Marshall, C.; Murphy, R.C.; Marshall, T., Inventors. System for Characterizing Semiconductor Materials and Photovoltaic Devices through Calibration.
U.S. Patent No. 5,757,474.
May 26, 1998; 50 pp.

Solar Energy—Thermal

Christensen, C.B.; Kutscher, C.F.; Gawlik, K.M., Inventors. Unglazed Transpired Solar Collector Having a Low Thermal-Conductance Absorber. U.S. Patent No. 5,692,491.
December 2, 1997; 8 pp.

Superconductivity

Bhattacharya, R., Inventor. Preparation of Superconductor Precursor Powders.
U.S. Patent No. 5,789,348.
August 4, 1998; 13 pp.

Bhattacharya, R.N.; Ginley, D.S., Inventors. Preparation of Transparent Conductors Ferroelectric Memory Materials and Ferrites.
U.S. Patent No. 5,785,837.
July 28, 1998; 6 pp.

Blaugher, R.D., Inventor. Two Chamber Reaction Furnace.
U.S. Patent No. 5,747,099. May 5, 1998; 6 pp.

Wind Energy

Muljadi, E., Inventor. Variable Speed Wind Turbine Generator with Zero-Sequence Filter.
U.S. Patent No. 5,798,632.
August 25, 1998; 25 pp.

Title Index

This index is an alphebetical list by subject of NREL-produced documents for fiscal year 1998. It includes our General Interest Publications, Technical Reports, Conference Papers/Journal Articles/Book Chapters, and Patents.

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Biomass Power

Photoconversion

Solar Energy—General

Superconductivity

Transportation

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