Determination of the Optimal Parameters for Self-Healing Efficiency of Encapsulated bacteria in Concrete Simulated Subtropical Climate Dataset

Dataset available at: https://digitalcommons.lsu.edu/transet_data/129

(This dataset supports report **Determination of the Optimal Parameters for Self-Healing Efficiency of Encapsulated bacteria in Concrete Simulated Subtropical Climate**)

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The related final report **Determination of the Optimal Parameters for Self-Healing Efficiency of Encapsulated bacteria in Concrete Simulated Subtropical Climate**, is available from the National Transportation Library's Digital Repository at https://rosap.ntl.bts.gov/view/dot/61852.

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Abstract: Concrete is a remarkable construction material. However, its low tensile strength makes it prone to cracking, which negatively affects its durability. To address this issue, bacterial concrete has been implemented as a self-healing alternative due to its capability to seal microcracks through microbial-induced calcium carbonate precipitation (MICCP). In this study, a bacterial strain (i.e, Bacillus Pseudiformus) was encapsulated through three different methods: encapsulation through hydrogel beads, vacuum impregnation on lightweight aggregates, and attachment to cellulose nanocrystals. Furthermore, three precursor types were used, magnesium acetate, calcium lactate, and sodium lactate were implemented. Compressive strength tests and flexural strength tests were performed on mortar specimens to characterize their mechanical properties. Once the crack was induced, samples were subjected to 28 days of wet/dry cycles in which the corresponding crack width was monitored. At the end of this period, the beams were retested to determine the strength recovery of the specimens. The results showed that the specimen groups in which calcium lactate was added to the cementitious matrix displayed the highest values in compressive strength. In terms of flexural strength, no major difference was found among the specimens. Moreover, the flexural strength recovery of the specimens did not show any significant difference as well. In terms of the healing efficiency, the sample that displayed the best results was the one containing calcium lactate as a precursor along with bacteria and yeast extract encapsulated in hydrogel beads. In addition, scanning electron microscopy (SEM) along with x-ray energy dispersive spectroscopy (EDS) was performed on the cracked specimens to characterize the healing products. Furthermore, a scale study was

performed on concrete samples to determine the long-term implications of adding encapsulated bacteria along with calcium lactate and yeast extract in concrete.
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Dataset description:
This dataset contains 1 file collection described below.

All_methods_info.zip:
- flexural strength hydrogel beads.xlsx
- Compressive Strength all methods.xlsx
- All cracks summary combined Hydrogel LWA CNC (version2).xlsx

File Type Descriptions:
- The .xlsx and .xls file types are Microsoft Excel files, which can be opened with Excel, and other free available software, such as OpenRefine.

National Transportation Library (NTL) Curation Note:
As this dataset is preserved in a repository outside U.S. DOT control, as allowed by the U.S. DOT's Public Access Plan (https://ntl.bts.gov/public-access) Section 7.4.2 Data, the NTL staff has performed ***NO*** additional curation actions on this dataset. NTL staff last accessed this dataset at https://digitalcommons.lsu.edu/transet_data/129 on 2022-05-25. If, in the future, you have trouble accessing this dataset at the host repository, please email NTLDataCurator@dot.gov describing your problem. NTL staff will do its best to assist you at that time.