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Effect of Treated Grey Water on Bacterial Concrete

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Abstract : Concrete is the most widely used structural material. It is usually made using locally available materials. However, concrete has low tensile strength and may crack in the early days with exothermic hydration, for which water is essential. To address the increased construction water demand, treated greywater may be used. Bacillus subtilis bacteria that form endospores is the biological agent considered in this study for biomineralization or Microbially Induced Calcite Precipitation (MICP) technique to heal cracks. Treated grey water which is obtained from STP of PES University, opted in place of Potable water, which had qualities within the standard range as per codal provisions. In this work, M30 grade conventional concrete is designed using OPC 53-grade cement, manufactured sand, natural coarse aggregates, and potable water. Conventional concrete (CC), bacterial concrete with potable water (BS), and treated grey water concrete (TGWBS) are the three different concrete specimens cast. Experimental studies such as the strength test and the surface hardness test are performed on conventional and bacterial concrete samples after 7, 28, and 56 days of curing. Concrete cubes are subjected to a temperature of 50° C to investigate the effect of higher temperature. Cracked cube specimens are observed for self-healing -as well as microstructure analysis with Scanning Electron Microscope (SEM), Energy Dispersive X-Ray Analysis (EDAX), and X-Ray Diffraction Analysis (XRD). Noticeable calcium salt deposition is observed on the surface of the BS and TGWBS cracked specimen. Surface hardness and the EDAX test gave promising results on the advantage of using spore-forming bacteria in concrete. This is followed by the strength gained in compression and flexure. Results also indicate that treated grey water can be a substitute for potable water in concrete.

Keywords : Bacillus subtilis concrete, microstructure, temperature, treated greywater
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