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A NOVEL WAY TO UTILIZE STEEL INDUSTRY WASTE: MICROBIAL MINERALIZED SLAG BLOCKS

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Abstract

This paper presents an experimental study on the beneficial application of steel slag (SS) in the making of slag block. Steel slag and slaked lime (SL) were used in optimal proportions in the production of eco-friendly blocks. The novelty of this experiment is that bio-mineralization was induced by way of mixing certain species of bacteria in the SS-SL paste. Microbial Induced Calcite Precipitation (MICP) is a biochemical process in which bacteria precipitate calcium carbonate from a supersaturated solution. In the present study bio-blocks were developed using steel slag and employing MICP process. SS and SL were used as sources of calcium carbonate. Steel slag also served as substitute for natural sand. To induce the precipitation of calcite, bacteria species namely Bacillus subtilis and Bacillus megaterium were blended with the SS-SL mix. Under ambient curing condition and carbon dioxide pressure curing condition, SS and SL were activated in the presence of bacteria to form a stable carbonate bond matrix. Block specimens prepared with a bacterial dosage of 0.6% v/v and SL-SS in the ratio of 1:2 showed higher compressive strength as compared to that of blocks constituted with SL-SS in the ratio of 1:2.5 and blocks made without the incorporation of bacteria. SEM and XRD studies confirmed microbial activity and precipitation of calcite.

Keywords: bio-mineralization, calcite precipitation, compressive strength, SEM analysis

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