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Improvement the Durability of Cement Mortar Against Magnesium Sulfate Using Biocalcification Phenomenon

Hussein Al-kroom[1,*], Mohamed Abd Elrahman[2] and Hamdy A. Abdel-Gawwad[3]

[1]Department of Civil Engineering, School of Engineering, The University of Jordan, Amman 11942, Jordan.

[2]Structural Engineering Department, Mansoura University, Mansoura 35516, Egypt

[3]S Housing and Building National Research Center (HBRC), Raw Building Materials and Processing Technology Research Institute, Cairo 12311, Egypt

*Corresponding author

Abstract

Microbiologically induced calcite precipitation (MICP) is a technique that comes under a broader category of science called biomineralization. It is a process by which living organisms form inorganic solids. Bacillus Pasteruii, a common soil bacterium can induce the precipitation of calcite. MICP is highly desirable because the calcite precipitation induced as a result of microbial activities, is pollution free and natural. A durability of control or treated cement mortar by bacterial cells against 5% magnesium sulfate, for one year, was studied. In this study the cement mortar mixed with one optical density (1.0 OD) of bacterial cells. Microbial calcite precipitation in cement mortar was visualized by SEM. Also, Ettrengite phase which formed in cement mortar matrix was identified by DTA analysis and visualized by SEM techniques. study demonstrated that the microbial induced calcite precipitation resulted in an increased resistance of mortar specimens, and sulfate penetration. The cement mortar mixed with bacterial cells was more durable than that of control sample against magnesium sulfate solution. calcite precipitated by bacterial cells filled the open pores of mortar which leads to decrease penetration or water absorption and, therefore, increase the compressive strength.

Keywords: bacterial cells, calcite, ettringite, cement mortar, degree of crystallinity, magnesium sulfate