

ENHANCING THE DURABILITY OF CONCRETE EXPOSED TO PIG MANURE USING SILICA FUME AND NANOSILICA

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Abstract: Concrete is one of the most used materials in farm environment for manure storage tanks and treatment systems, however the acids present in manure may cause wear, loss of strength and damage to concrete structures. Ways to reduce the carbon footprint of concrete include minimizing construction defects as well as making concrete last longer. Thus, since the use of supplementary cementitious materials may enhance concrete durability, this study evaluated the behavior of concretes with silica fume and nanosilica to an acid attack, simulating the effects of the acids present in pig manure. The use of 5% and 10% of cement replacement by silica fume in concrete as well as the incorporation of nanosilica as an additive was investigated. The samples were subjected to dry-wet cycles in acidic solution and in saturated limewater. Variation of mass and water absorption were measured along the cycles. The compressive strength at 28, 56 and 84 days was also determined. Results indicated that the combined use of silica fume and nanosilica enhanced the compressive strength of concrete. Concretes with 10% of cement replacement by silica fume presented the best resistance to the acidic solution, presenting less mass loss, less water absorption and less loss of compressive strength.

Keywords: Pig manure, concrete, durability.



Video presentation