

Investigation of the Impact of Nanotechnology on the Freeze-Thaw Durability of Concrete Containing D-Cracking Aggregates

Report Number: KS-15-02 • Publication Date: May 2015

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Introduction

Freezing and thawing damage is the most common cause of distress in Kansas pavements. Many locally available aggregates in Kansas do not meet current standards for use in concrete pavements because of poor freeze-thaw durability. The use of nanotechnology to potentially improve the performance of aggregates with poor freeze-thaw durability in concrete was explored.

Project Objectives

The research objectives of this study were as follows:

- To determine if impregnation of aggregates with poor freeze-thaw durability by nanoparticles could improve the behavior of concrete made with the aggregates in freezing and thawing conditions.
- To determine if penetrating sealers or latex additives could be used to treat and consequently improve the performance of concrete containing aggregates with poor freeze-thaw durability.

Project Description

Aggregates were impregnated by silica, alumina, and titanium nanoparticles, sealed with three different sealers, or soaked in a latex solution before inclusion in concrete mixtures and testing in freezing and thawing. Additionally, a powdered latex additive was added as a cement additive to an additional concrete mixture.

Project Results

While the nanoparticles, two sealers, and soaking in the latex solution slightly improved the performance of concrete in a freezing and thawing environment, none of the treatment methods improved the performance significantly enough for inclusion in Kansas pavements.

Project Information

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