

JOINT TRANSPORTATION RESEARCH PROGRAM

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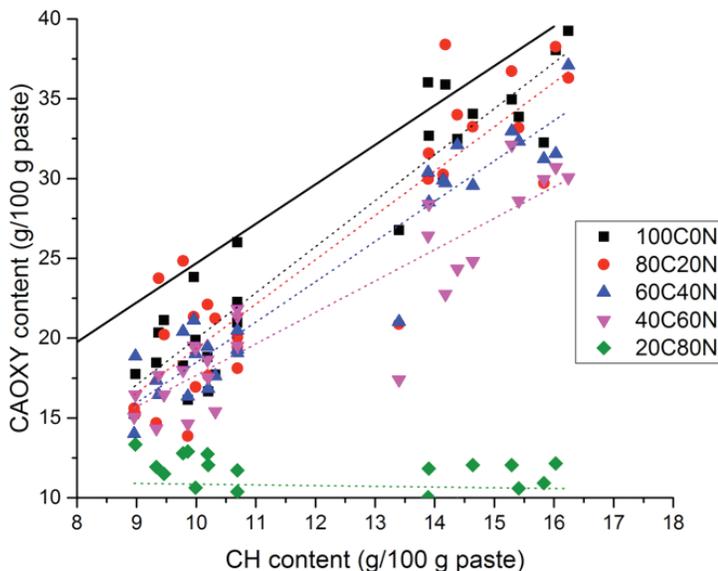
Performance of Concrete Pavement in the Presence of Deicing Salts and Deicing Salt Cocktails

Introduction

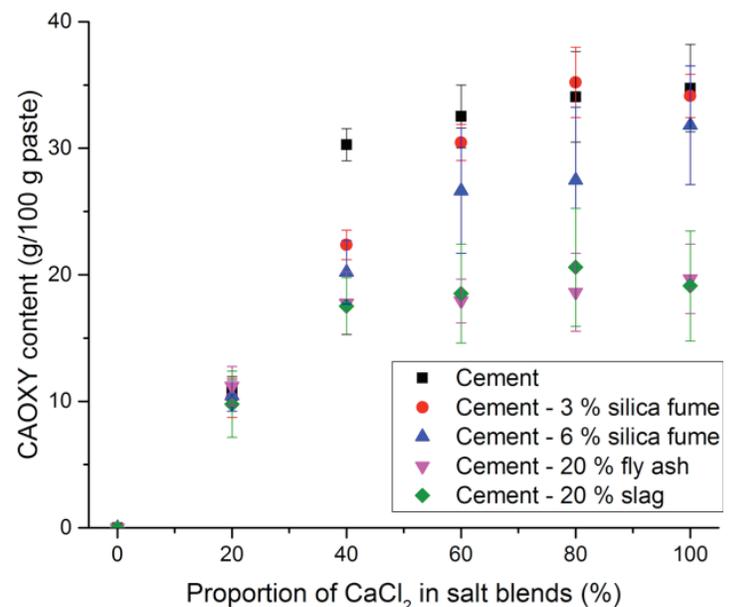
This report is a summary of work performed to assess the performance of concrete paving materials in the presence of deicing salts and deicing salt cocktails as a part of the Joint Transportation Research Program (JTRP) through SPR-3864. This report describes the two main objectives of this work. First, the report documents the development a standardized approach to use low temperature differential scanning calorimetry (LT-DSC) to assess the influence of cementitious binder composition on the potential for calcium oxychloride formation. Second, this work will assess the influence of blended salt cocktails on the formation of calcium oxychloride.

Findings

- Some concrete pavements have shown premature deterioration at the joints. It has been proposed that this can be attributed to two primary factors: increased fluid saturation and a chemical reaction that occurs between deicing salts and the cement matrix.
- A test method was developed/formalized that uses a low temperature differential scanning calorimeter (LT-DSC) test method to quantify the chemical reaction that occurs between the cementitious matrix and the deicing salt to form calcium oxychloride.
- It is proposed that the LT-DSC test be used to qualify the potential for calcium oxychloride formation in a cementitious matrix. Currently two primary



Relation between CAOXY and CH contents for several salt blends (where aCbN denotes a salt blend having proportions a % CaCl_2 and b % NaCl).



Relation between CAOXY and proportion of CaCl_2 in salt blends.

approaches appear poised to have the potential to mitigate calcium oxychloride formation. These include the replacement of a portion of cement with supplementary cementitious materials and the use of concrete sealers such as soy methyl ester polystyrene blends.

- This report has shown that as the calcium hydroxide (CH) content in the paste increases, so does the potential for calcium oxychloride (CAOXY) formation. CAOXY contents increase with the proportion of CaCl_2 solution in the blends. A simple model has been developed to estimate the amount of calcium oxychloride formed in the pastes, depending on the calcium chloride and calcium hydroxide contents.

Implementation

This report describes the development a standardized approach to use low temperature differential scanning calorimetry (LTDSC) to assess the influence of cementitious binder composition on the potential for calcium oxychloride formation. This procedure is well founded and is written in ITM format and can be considered for acceptance by INDOT as a test method and forwarded

to AASHTO for national consideration as well. The work is documented, accurate and peer reviewed. Second, this work assessed influence of blended salt cocktails on the formation of calcium oxychloride in various cementitious systems. The work indicates that calcium oxychloride formation can be reduced with the use of supplementary materials, the use of topical treatments, and judicious selection of blend formulations.

Recommended Citation for Report

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