

Abstract

Aggregates are the major ingredients in concrete and asphalt pavement. This study focuses on the durability behaviour of aggregates. The change in gradation (change in particle size distribution) of four different aggregates subjected to sodium sulphate soundness test is compared with that resulting from a newly proposed confined freeze-thaw test. Gabbro has been identified as least durable amongst the aggregates compared by both these tests. Further, the response of syenite and gabbro in the presence of magnesium chloride, a popular de-icing salt has been studied. The results suggest that the gabbro, a sample containing ferromagnesian minerals suffers excessive deterioration in the presence of magnesium chloride. Further, limestone aggregate has been tested in presence of synthetic acid rain. Results suggest that the deterioration suffered by limestone even in mild acidic condition (pH of 4.5) is more than that when subjected to confined freeze-thaw test or sodium sulphate soundness test. The present work also proposes a new durability quantification. For this purpose, a model has been developed and validated which predicts the gradation of the sample at any stage from the initial gradation.

Keywords: Durability of aggregates, soundness, sulphate soundness test, freeze thaw test by water