Confirmation of TICC damage hypothesis. Petrographic study

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Journal of Materials in Civil Engineering
Vol. 3, Issue.3, 1991

Abstract: It is hypothesized that heating/cooling cycles of concrete lead to internal stresses and subsequent microcracking as a consequence of incompatible coefficients of thermal expansion of aggregate and paste. This phenomenon is known as the thermal incompatibility of concrete constituents (TICC) and has been experimentally investigated by many researchers in terms of strength and durability measurements of thermally cycled concrete specimens. This work is an experimental investigation into the TICC phenomenon by conducting a petrographic study on the formation of TICC microcracking and identifying its size. Petrographical study is carried out on three types of concrete: (1) Portland cement concrete; (2) superplasticized concrete; and (3) latex modified concrete. Thin and polished sections are prepared from thermally cycled and noncycled specimens. These sections are then examined under optical microscope to detect any microcracks. The results of this work reveal the development of microcracks at the cement paste surrounding the aggregates. Such microcracks vary in width between 5 and 25 ¿¼m. The examinations of thin and polished sections have shown reduction of microcracks in superplasticized concrete and latex modified concrete, as compared to portland cement concrete.