



Alkali-silica or alkali-carbonate reaction: petrographic analysis of concrete containing limestone aggregates

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Open cracks, white coatings and concrete fracture network have been observed in concrete crash barrier built in the late 1990s of 20th century containing limestone coarse aggregates and quartz sands in fine aggregates. The observed damage phenomena have been attributed to the alkali-silica reaction (ASR) after detailed macroscopic and microscopic examination.

Analytical methods conventionally used in concrete petrography, e.g. optical microscopy of thin sections, petrographic image analysis and SEM/EDS study, were employed in order to: (1) quantify the extent of the damage (volume percentage of alkali-silica gel); (2) determine the causes of the damage.

The alkali-silica gels, cracks passing the aggregates and the aggregate boundaries attacked by cement paste were found spatially associated with limestone coarse aggregates containing fine-grained siliceous cherts. Other alkali-silica gels were found filling the pore voids. Fine aggregates composed of monomineral quartz fragments have not shown any influence on ASR. The volume of alkali-silica gels in the studied concrete samples (ranging from 2.3 to 4.9 vol. %) and the volume of cracks (ranging from 1.2 to 4.4) correlate with total amount of chert-rich carbonates.