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IDENTIFICATION OF ALKALI-SILICA REACTION OUTCOMES

Portland cement-based concrete is widely used in civil engineering. Therefore, it is very important to determine the preconditions of corrosion of the cement concrete. The service life of concrete structures can be substantially reduced by the alkali-silica reaction. It is well known that this reaction causes formation of the sodium silicate hydrogel. Thus, by identifying this gel, a researcher can make an assumption about the reasons for the corrosion. Obviously, macroscopic quantities of sodium salts can be discerned using analytical chemistry methods. Unfortunately, determinant values of such salts in the concrete structure are usually very small. Thus, there is a need for special research methods.

Raman spectroscopy is an advanced method based on the analysis of instantaneous two-photon non-elastic light scattering. This method is applicable even in case of small quantities of chemicals under research. The first successful study of silicates using Raman spectroscopy methods was performed in the 20ies of the 20th century. In this work the authors have proven that sodium hydrogels can be easily identified in the concrete using the Raman spectroscopy. In the course of the analysis of the inter-phase boundary between the cement stone and the aggregates, the authors observed, at least, one spectral peak which did not belong to cement or to the disperse phases of the concrete. At the same time, this peak can be classified as a peak of the sodium silicate. Thus, sodium silicate gel is generated during the service life of the structure under research, and this research has revealed the presence of the alkali-silica reaction.

Key words: concrete, alkali-silica reaction, Raman spectroscopy.

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