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Study of the alkali-silica reactivity potential of sands and gravels from Czech quarternary deposits by petrographical and dilatometrical methods

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The alkali-silica reactivity (ASR) potential of sands and gravels used in concrete were tested by the RILEM petrographical method, ASTM C1260 accelerated mortar bar method, and the gel-pat test method. The image analysis facilitated quantification of certain petrographic parameters (modal composition, grain shapes). Mineral and rock fragments were grouped according to their reactivity to the reactive phases (quartzite, crystalline and glassy volcanic rock), potentially reactive phases (monomineral quartz, sediments, tuffs), and non-reactive phases (granitoids, monomineral feldspars and micas).

The expansion potential of studied sands and gravels was evaluated from the dilatational values obtained from mortar bar method (ASTM C1260). From 20 samples, 9 were classified as non-reactive, 9 as potentially reactive and 2 samples as reactive. After the tests, another set of thin sections was studied by conventional optical microscopy and petrographic image analysis to evaluate relationship between petrography and occurrence of alkali-silica-gels. The products of ASR were found in pores, cement matrix and in contact with monomineral quartz, quartzite and volcanic rock fragments.

The relatively low correlation between quantitative petrography data and dilation values are caused by great volume of monomineral quartz fragments that are generally classified as the potentially reactive phase. This assumption was confirmed during conventional optical microscopy of thin sections from mortar bar test specimens. The existence of ASR and the presence of alkali-silica gels were proofed for only a small part of monomineral quartz fragments.

The gel-pat test was applied to study the behaviour of aggregates in cement environment. The origin of alkali-silica reaction was observed in gel-pat test specimens using conventional optical microscopy and low vacuum electron microscopy. This method facilitated the study of alkali-silica gels and their chemical composition in the source site without any following modification.