



Microscopic examination of volcanic rocks subjected to alkaline leaching

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Volcanic rocks supply one third of crushed stone in the Czech Republic. Some of these rocks significantly contribute to concrete damage by alkali silica reaction (ASR) as has been recognised by previous studies in several concrete constructions (dams, highways, bridges). In recent study, volcanic rocks (basalts, spilites, melaphyres, phonolites, rhyolites, diabases) were subjected to several test procedures aiming to evaluate their ASR potential. The experimental study employed accelerated mortar bar test (following the standard ASTM C1260), chemical test (following the standard ASTM C289), and microscopic techniques (polarising microscopy, scanning electron microscopy combined with energy dispersive analysis). The interaction of cement paste and aggregate under high alkaline solution and increasing temperature conditions takes place during the accelerated mortar bar test. Microscopic techniques applied on mortar bar specimens enabled identification of ASR products (alkali-silica gels). Chemical test quantified ASR potential based on the amount of Si^{4+} leached into the solution within 24 hours testing period and contemporaneous reduction of alkalinity. Volcanic particles leached in alkaline solution were subjected to microscopic analysis with the aim to find minerals (phases) affecting their ASR potential. ASR of volcanic rocks was found highly variable connected to the mineral composition. The highest degree of ASR was found in connection with melaphyres, rhyolites and one sample of spilite. The main factor influencing ASR of investigated aggregates is regarded in the presence of SiO_2 -rich phases (e.g. SiO_2 -rich glass).