



MINERALOGY-INC

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Alkali Silica Aggregate Reactions (ASR)

Alkali Silica Aggregate Reactions (ASR) represent a category of concrete weathering or diagenesis in which alkali-sensitive aggregate particles undergo marginal swelling due to the penetration of hydroxyl ions sourced from the cement paste of the concrete. Aggregate types that are recognized as potentially 'alkali-sensitive' include relatively acidic, microcrystalline grain types such as chert, glass-rich volcanic rock fragments, chalcedony, opal, and selected types of clay-rich shale & slate rock fragments (RFs). In addition to the alkali-sensitive aggregate materials, the development of ASR within hardened concrete structures requires sufficiently elevated levels of relative humidity and alkalinity. ASR typically results in the localized alteration and swelling of the alkali-sensitive aggregate materials which are in turn, encased within a groundmass or matrix of rigid cement paste. The swelling of these grains ultimately contributes to the development and growth of complex networks of expansive strain microfractures that typically contain amorphous metasilicate gel – a weathering byproduct of the ASR process. Concrete structures effected by ASR commonly exhibit shallow, concave-up fractures that weaken the cohesive integrity of the substrate and locally yield surface spalls representative of aggregate particles that have swollen and detached from the adjoining cement materials. The application of impermeable flooring systems atop concrete slabs effected by ASR is almost certain to accelerate the weathering process due to the entrapment of concrete moisture and the resulting elevation of relative humidity and alkalinity levels.