

HIGHLIGHTS AND BREAKTHROUGHS

Safe long-term immobilization of heavy metals: Looking at natural rocks

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Abstract: Portland cement clinker is primarily used in building and construction, with a global annual production of ~4 billion tonnes. Part of it is also used for immobilization of hazardous materials (e.g., industrial slurries, harbor bottom sludge, shredded tires), notably those containing toxic metals like e.g., zinc, cadmium, barium (Trezza and Scian 2000). Limited amounts may be added to the raw meal and get incorporated into the clinker minerals upon burning (Taylor 1997), assuming they remain immobilized in the high-pH concrete or mortar environment after hydration and setting of the cement. Extensive laboratory tests seem to confirm effective mobilization, but are generally of limited duration for reason of practicality. Access to sample materials from centennia- or millennia-old structures is limited for reasons of cultural heritage preservation, and none of these structures were originally designed for environmental reasons. The paper by Khoury et al. (2016) analyzes uncommon combustion-metamorphic rocks from Jordan closely resembling cement-immobilized waste, exposed to supergene weathering and alteration over time spans far exceeding experimental practicality. **Keywords:** Combustion metamorphism, impure chalk-marl, lime-monteponite series, portlandite, weathering, alteration, cadmium, immobilization