Natural cementitious analogues of Jordan

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The pyrometamorphic rocks in Jordan (Daba-Siwaqa, Suweileh and Maqarin) are unique and represent *natural analogues* of Portland cement for sealing of nuclear waste. The Natural occurrences are of great aerial exposure and offer good example to study the interaction of cementitious hyperalkaline leachates on repository host rock. Similarity to cement processes and products is much more obvious than in any of the occurrences reported before. The similarity extends beyond strong mineralogical equivalence. The source of energy for this extremely energy intensive process was the same as cement kilns (fossil fuel from oil shale).

Maqarin area represents an early stage in the evolution of cementitious repository.

Suweileh and Daba-Siwaqa areas represent a later stage. Results on natural analogues in Jordan indicate that secondary minerals as smectites, sulphates, and hydrated aluminium silicates act as a sink for hazardous elements. Highly alkaline (pH = 12.7) ground water dissolves from the combusted bituminous marl the radionuclides and heavy metals (Cr, Zn, V) and reprecipitate it farther down when reducing conditions are encountered [1].

[1] Kamei *et al*. (2010) *ICEM2010*, 3–7 October, Tsukuba, Japan, ICEM10-40063.

Photochemical production of dissolved organic and inorganic nutrients from resuspended sediments

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A series of photolysis experiments were conducted in the presence and absence of tidal creek and continental shelf sediments to address the role of resuspension on nutrient fluxes in estuarine and coastal waters. There was a significant increase in TDN, phosphate and DOC when sediments were resuspended in overlying water and exposed to six hours of simulated sunlight. The majority of dissolved N was released as DON (87%) with relatively lesser amounts of ammonium (13%) and little or no nitrate. Results from autoclaved sediments suggest the mechanism of photolytic release was predominately abiotic. Results demonstrate that photoproduction from resuspended sediments is an episodically significant and previously unrecognized source of dissolved nutrients to coastal ecosystems receiving sediment plumes. This process may be especially important for continental margins where resuspension events occur as well as in regions experiencing high riverine sediment fluxes resulting from erosion associated with deforestation and desertification. The presentation also considers how photolytic fluxes of organics and nutrients may respond in the future during periods of salinity alteration as sea level rises.