Geochemical analyses as a discriminating tool for paleoenvironmental studies of shallow-marine carbonate rocks

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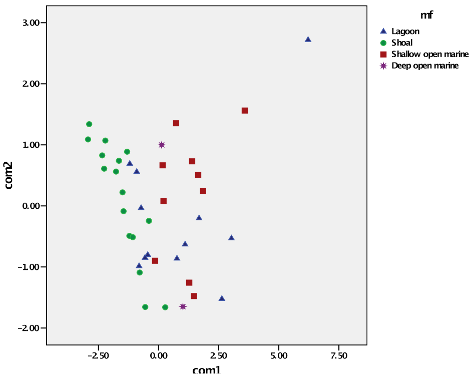
Contrary to the situation with pelagic carbonates, geochemical studies of neritic carbonates cannot yet be dissociated from sedimentological and diagenetic studies [1].

This study presents results of a geochemical analysis (Sr, Mg, Fe, and Mn) of a section of Aptian-Albian shallow-marine carbonates from the south of the Zagros Basin. It was carried out in order to (1) compare the variations in contents of trace elements with sedimentological data, and (2) determine as far as possible the proportion of the geochemical signal caused by paleoenvironmental variations. A detailed sedimentological study of Kuh-e Siyah section reveals five major environments that make up a depositional profile succession grading from Intertidal to deep open marine. Statistic analyses of the geochemical data (box diagrams and principal component analysis, PCA) are used to investigate similarities between the variations of trace element contents and depositional environments. The relationship is highly significant for Sr, Fe, and Mn. A number of a posteriori tests are performed with this ANOVA to compare the geochemical data for each environment. Trace elements analysis shows that Sr, Fe, and Mn can partially record indications about paleoenvironmental conditions in shallow-marine carbonates.



Samples plotted in the PC space polarized according to trace element contents. Certain environmental fields seem to stand out when the samples are arranged with their environmental attributions.

[1] Vincent *et al*. (2006) Facies **52**, 69–84.

Transport of Plutonium association and intrinsic colloids in saturated porous media

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A number of nations are irreversibly invested in plutonium now and into any foreseeable future. With this investment comes a continuing obligation to understand and manage this material responsibly in all applications. The eventual release of Plutonium (Pu) into accessible environments will cost many billions of dollars in research, remediation, and in compromised land and water resources. Current predictive models of Pu transport in subsurface environments fail to adequately integrate colloidal transport mechanisms. An accurate model shall couple interfacial processes, such as colloid attachment and detachment at mobile and immobile surfaces and coagulation in bulk solution, with the flow and transport models. These interfacial processes are governed by the electrokinetic properties of colloids and surrounding interfaces, and can also be dictated by electrokinetic phenomena.

In this talk, current understanding, gaps, and needs in the area of colloid transport of Pu will be discussed. Most recent developments will be emphasized. Results of dynamic transport experiments involving intrinsic and association Pu colloids transport in columns packed with a saturated porous medium will be presented, together with electrokinetic and stability measurements of the Pu colloids. In these experiments, association colloids were prepared by sorbing Pu (V) onto natural smectite colloids collected from of a testing well (NC-EWDP-19D1) at the Nevada Test Site (NTS). Intrinsic Pu colloids were prepared following a procedure similar to that outlined in Lloyd and Haire [1]. The experiments used natural alluvial material and groundwater obtained for the same testing well at the NTS.

Results indicated a significant transport enhancement of both types of both association and intrinsic Pu colloids compared to dissolved Pu, which was completely retaind by the alluvial material. Electrokinetic and stability measurements are undergoing, which will be combined with the column transport data to elucidate the role of interfacial processes.

[1] Lloyd & Haire (1978) *Radiochemica Acta* **25**, 139–148.