Bio-influence on the metal precipitation in ferromanganese nodules of the Central Indian Ocean Basin

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In deep-sea ferromanganese nodules metals can precipitate by chemical oxidation and/or by microbial enzymatic processes [1-4]. Using high resolution FEG-SEM we have documented varieties of ultra-microfossils in the ferromanganese nodule samples of the Central Indian Ocean Basin (CIOB) (e.g., Fig. 1).

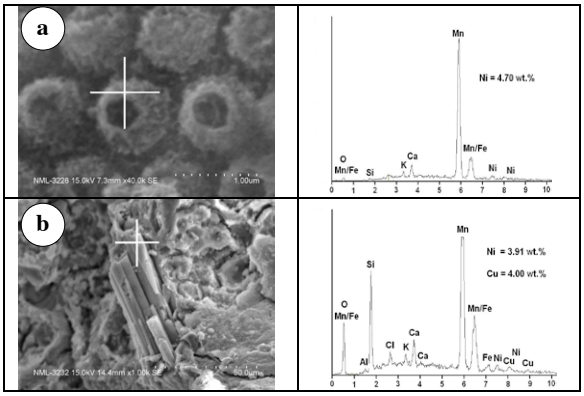

Figure 1: Fossilized microbes with their corresponding EDAX analysis at marked cross points; **(a):** clumpy microbes; **(b):** rod-shaped bacteria.

These fossilized microbes are mostly protozoa belonging to varieties of bacteria, diatoms and foraminifera. The chemical compositions of these ultra microfossils indicate a high-level of manganese precipitation in and around them. While clumpy microbes are enriched with Ni, the rod shaped bacteria are rich in Cu. Up to 4.7 wt.% Ni and 5.3 wt.% Cu have been recorded in the fossilized microbe bodies. The high abundance of ultra-microfossils and their chemical compositions indicate that microbes played a major role in the precipitation of metallic elements in the ferromanganese nodules of the CIOB.

[1] Graham & Cooper (1959), *Nature* **183**, 1050-1051. [2] Greenslate (1974), *Nature* **249**, 181–183. [3] Roy (2006), *Earth Sci. Rev.* **77**, 273-305. [4] Wang *et al.* (2009), *Mar. Biotech.* **11**, 99-108.

Characterization of Diagenetically Altered Carbonate Reservoirs, Asmari Formation, Dezful embayment, SW Iran

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The Oligocene-Miocene Asmari carbonate Formation is wellknown as a major hydrocarbon reservoir in southwestern Iran. Determining the Asmari Formation reservoir quality based on defining diagenetic evolution were deduced from microscopic description of thin sections. Development of reservoir quality appears to be controlled effectively by diagenesis. Investigations reveal that diagenetic factors including compaction, cementation (by anhydrite, calcite and dolomite), dolomitization, dissolution and their effect on porosity changed the reservoir quality. Compaction and significantly cementation reduced the porosity however; this effect was healed by later dissolution and leaching processes. Dolomitization in this Formation enhanced the original porosity in depositional textures and protracted dolomitization created intercrystalline porosity, creating the best reservoir facies in SW Iran [1]. Two kind of distinct dolomitic textures involve fine to medium dolomite crystals (20-100μ) increased the intercrystaline porosity while the other, coarse mosaic of dolomite crystals (>100μ) especially associated with mud residuals are shown degradation effect on reservoir quality. It will be appeared that rock-water interaction lead to dissolution and dolomitization phenomenon which are the most important processes fortify pore spaces and controlling the reservoir quality in the Asmari Formation of SW Iran.

[1]Aqrawi *et al.* (2006) Journal of Petroleum Geology, **29**, 381-401.

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