Effects of mining on groundwater quality in Gaft Chromite Mine, Iran

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Effluent from chromite mines due to extraction activities into aquatic systems is an environmental issue [1, 2]. To investigate the effects of chromite extraction on the groundwater quality in Gaft Chromite Mine, water samples were taken from the mine area.

Due to basic condition of the tunnel effluent (pH=9.74), solubility of most ions decreased [3, 4] and thus EC, total hardness, and concentration of ions in tunnel effluent were similar to the upstream groundwater as well as groundwater in the mine site [Fig.1]. In other words, mining activities had no adverse effect on the water quality of the region although it slightly increased the concentration of Cr (VI) in the groundwater in the mine site. The concentrations of Cr (IV) in water samples were 0.04, 0.04, 0.06 and 0.02 (all in mg/L) in upstream and downstream groundwater, groundwater in the mine site, and tunnel effluent respectively. Because of the geochemical condition downstream of the mine [5], the reduction in the pH of downstream groundwater (pH=8.13), the concentration of bicarbonate, chloride, calcium, magnesium, and sodium ions as well as the total hardness and EC in downstream groundwater (4 Km far) were increased.

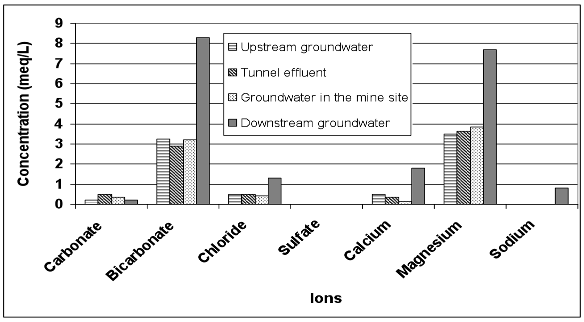

Figure 1: Concentration of ions in water samples.

[1] Seralathan Kamala-Kannan *et al.* (2008) *Chemosphere* **71** 1233-1240. [2] Aradhi K. Krishna *et al.* (2009) *Journal of Hazardus Material* **167** 366-373. [3] Takeno (2005) *Geological Survey of Japan Rep. No. 419*. [4] Ratnakar Dhakate and V. S. Singh (2008) *Journal of Geography and Regional Planning* **4** 058-067. [5]Vatanpoor (2005) *Gaft Mine Comprehensive Exploration*.

Zircon Hf-O isotope evidence for crust-mantle interaction during continental deep subduction

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In situ SIMS zircon U-Pb dating and O isotope analysis as well as LA-(MC)-ICPMS zircon U-Pb dating and Lu-Hf isotope analysis were carried out for postcollisional mafic-ultramafic rocks in the Dabie orogen, China. The zircon U-Pb dating gives consistent ages of 126±1 to 131±1 Ma for magma crystallization. Survival of residual zircon cores is identified by CL imaging and U-Pb dating, yielding ages of 697±10 and 770±11 Ma that agree with protolith ages of UHP metaigneous rocks in the orogen. Zircon Hf-O isotope compositions show systematic variations that can be categorized into three groups. Group I has the lowest $\delta^{18}O$ values of 2.0 to 2.9‰ but the highest $\varepsilon_{Hf}(t)$ values of -6.3 to 1.1 with the youngest Hf model ages of 1.1 to 1.6 Ga. Group II displays intermediate $\delta^{18}O$ values of 4.0 to 5.1‰ and $\varepsilon_{Hf}(t)$ values of -29.0 to -9.9 with Hf model ages of 1.8 to 3.0 Ga. Group III exhibits the highest $\delta^{18}O$ values of 5.2 to 7.3‰ but the lowest $\varepsilon_{Hf}(t)$ values of -33.7 to -18.2 with the oldest Hf model ages of 2.3 to 3.3 Ga. The three groups of Hf-O isotope compositions correspond to a three-layer Hf-O isotope structure in the subducted continental crust, suggesting its involvement in the mantle source. Along with existing data for whole-rock Sr-Nd isotopes and trace elements, it appears that the mantle source for the postcollisional mafic-ultramafic rocks is characterized by fertile lithochemistry, the continental crust-like signature of trace elements, the heterogeneous enrichment of radiogenic isotopes, the differential incorporation of supracrustal materials, and the variable concentrations of water. Clearly, such a source is neither the asthenospheric mantle nor the refractory subcontinental lithospheric mantle (SCLM). It is a kind of orogenic SCLM that would be generated by reaction of the overlying SCLM peridotite with hydrous silicate melts derived from the different layers of subducted continental crust. Therefore, the postcollisional mafic-ultramafic rocks provide a petrological record of crust-mantle interation during the continental deep subduction. Melt-peridotite reaction is hypothesized to take place in the Triassic to generate the mantle source of pyroxenite and hornblendite, which underwent partial melting in the Early Cretaceous to cause the mafic-ultramafic magmatism.