

Geogenic and Anthropogenic Chromium Contamination in Groundwater of an Ophiolitic area, North-eastern Iran

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Geology of Iran shows an ophiolitic belt around the central Iran's micro-continent. One of the main ophiolite suite, with ca 100 km long and 15 km wide, located northeastern Iran. Ultramafic rocks of this ophiolite suite, display high concentration of chromium (1000- 3000ppm) as a compatible element especially in pyroxene group minerals. Average Chromium content of this ophiolite suite in peridotites is 2558ppm, with maximum 4525ppm (in pyroxenite) and minimum 832ppm (in dunite). Dunites, lay down at the base of this suite rocks, contain chromite (FeCr_2O_4) lenses with 20.56wt% Cr_2O_3 . Today, 10 active mining sites excavate ultramafic rocks for chromite ore mineral and altered ultramafic rocks, serpentinite, dump as unconsolidated gunge materials along stream pathways. There is an unconfined aquifer just southern these ophiolite range containing detrital altered ultramafic rocks with high concentration of chromium minerals. In this study 23 groundwater samples, collected from unconfined serpentinite alluvium aquifer that shows cumulative increasing Cr towards south because of increasing residence time, and much more water-rock interactions. Total Cr concentrations in this aquifer are from 12 to $61\mu\text{g/l}$, higher than normal level of Cr mentioned by WHO ($2\mu\text{g/l}$). On the other hand discharging of chromite mine and mineral processing site, contaminate one of drinking well at Forumad village up to $61\mu\text{g/l}$ of total chromium. Although trivalent Cr is essential nutrient but in oxidation conditions with increasing Eh and pH in altered serpanitized peridotite it change to chromate (CrO_4^{2-}) and dichromate ($\text{Cr}_2\text{O}_7^{2-}$) as dissolved anions which will be toxic and carcinogenic in ground water. Based on California EPA Office of Environmental Health Hazard Assessment (OEHHA), 7.2% of total Cr is hexavalent. Recent information indicates that hexavalent chromium is 50 to 90% of the total chromium in many water supplies [1].

[1] Morry, B., 1999, *Public Health Goal for Chromium in Drinking water*. California Environmental Protection Agency.