

Abstract CDD 2020

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Title : Isotopic fractionation of chromium during transfer in mining impacted paddy soils

Mining activities release considerable amount of chromium into the environment. During the extraction of chromium ores called chromites, tailings are stored in the air. When these non viable economically wastes are weathered, chromium is leached with runoff waters. In this study, we focus on the mining area of Sukinda Valley (Orissa, India) which comprises of ~98% of India's chromium ore reserve. There are 85% of deaths due to chromite mine related diseases in the region. This valley was studied in order to determine to what extent Cr speciation and Cr isotopic signature, $\delta^{53}\text{Cr}$, can help to identify Cr sources and the biogeochemical processes enhancing or limiting Cr mobility towards the surrounding paddy soils. The chemical characterization of artificial ponds and natural surface and underground waters revealed an increasing gradient of Cr concentration in the valley. The Cr concentration in waters sampled from the geochemical background was below IPC-OES detection limit while the waters concentrations near the mines were up to 1.6ppm. The exchangeable Cr(VI) in tailings was 0.4wt% and up to 0.025wt% in paddy soils. The isotopic signature of underground water was $-0.05 \pm 0.02\text{‰}$. However, the surface waters and artificial ponds $\delta^{53}\text{Cr}$ were $1.04 \pm 0.04 \text{‰}$ and $1.75 \pm 0.02\text{‰}$ respectively, suggesting that Cr is under its toxic form Cr(VI). These results are consistent with runoff waters draining the mine, however Cr undergo further chemical reaction before reaching the aquifer.

Keywords: *chromium, geochemistry, mine, paddy soil, leaching, speciation, isotopic fractionation*