

[DOI: 10.20472/IAC.2018.044.012](https://doi.org/10.20472/IAC.2018.044.012)

VLADISLAV CHRASNÝ

Czech University of Life Sciences Prague, Czech Republic

CR ISOTOPES AS A VALUABLE TRACER OF CR(VI) REDUCTION IN POLLUTED (GROUND)WATERS

Abstract:

Chromium stable isotopes are of interest in many geochemical studies as a tool to identify Cr(VI) reduction in groundwater aquifers. At four industrial sites in the Czech Republic, we evaluated the extent of spontaneous removal of toxic Cr(VI) contaminated by Cr-plating baths.

Prior to field studies we tested the short-term stability of Cr(VI) in groundwater samples. We follow conventional methods for Cr(VI) stabilization given by US EPA and APHA-AWWA-WEF protocols. We found significant Fe, Mn-induced Cr(VI) reduction in anthropogenically contaminated groundwater samples regardless of the sample treatment (alkalization, pH>8 and lower temperature, <5°C).

Chromium plating baths and wastewaters started to contaminate groundwaters in the late 1940s. Since plating shops at all sites still operate, it was possible to determine the Cr signatures of the plating baths. The $\delta^{53}\text{Cr}$ values of the plating baths at all sites are around 0‰. During natural attenuation, the $\delta^{53}\text{Cr}$ value of the residual Cr in the groundwater increased. The magnitude of the average positive isotope shift (expressed as $\delta^{53}\text{Cr}$ value) from the plating bath to groundwater was 1.1, 1.3, 3.3 and 3.3‰ at Zlate Hory, Loučna nad Desnou, Letnany, and Velesin, respectively. The Rayleigh models indicated that Cr(III) precipitation may have removed up to 60% of the Cr(VI) content after 65 years of contamination history.

Keywords:

hexavalent Cr; chromium isotopes; chromium reduction; ground waters; industrial pollution

JEL Classification: K32, C93