Geophysical Research Abstracts
Vol. 17, EGU2015-754, 2015
EGU General Assembly 2015

Genesis and transport of hexavalent chromium in the system ophiolitic rocks – groundwater

Anastasia Shchegolikhina (1), Laura Guadagnini (2), and Alberto Guadagnini (2)

(1) Department of Hydrogeology, Engineering Geology and Hydrogeoecology, Tomsk Polytechnic University, Tomsk, Russian Federation (a.shchegolikhina@yandex.com), (2) Dipartamento di Ingegneria Civile e Ambientale, Politecnico di Milano, Milan, Italy

Our study aims at contributing to the quantification and characterization of chromium transport processes from host rocks and soil matrices to groundwater. We focus on dissolved hexavalent chromium detected in groundwaters of geological regions with ophiolitic rocks (ophiolites and serpentinites) inclusions due to its critical ecological impact. (Oze et al., 2004).
Despite the large number of analyses on the occurrence of high concentrations of hazardous hexavalent chromium ions in natural waters, only few studies were performed with the objective of identifying and investigating the geochemical reactions which could occur in the natural system rock – groundwater – dissolved chromium (Fantoni et al., 2002, Stephen and James, 2004, Lelli et al., 2013). In this context, there is a need for integration of results obtained from diverse studies in various regions and settings to improve our knowledge repository.
Our theoretical analyses are grounded and driven by practical scenarios detected in subsurface reservoirs exploited for civil and industrial use located in the Emilia-Romagna region (Italy). Available experimental datasets are complemented with data from other international regional-scale settings (Altay mountains region, Russia). Modeling of chromium transformation and migration particularly includes characterization of the multispecies geochemical system. A key aspect of our study is the analysis of the complex competitive sorption processes governing heavy metal evolution in groundwater.
The results of the research allow assessing the critical qualitative features of the mechanisms of hexavalent chromium ion mobilization from host rocks and soils and the ensuing transformation and migration to groundwater under the influence of diverse environmental factors. The study is then complemented by the quantification of the main sources of uncertainty associated with prediction of heavy metal contamination levels in the groundwater system explored.

Fantoni, D., Brozzo, G., Canepa, M., Cipolli, F., Marini, L., Ottonello, G., Zuccolini, M., 2002. Natural hexavalent chromium in groundwaters interacting with ophiolitic rocks. Environmental Geology 42, 871-882.
Lelli, M., Grassi, S., Amadori, M., Franceschini, F., 2013. Natural Cr(VI) contamination of groundwater in the Cecina coastal area and its inner sectors (Tuscany, Italy). Environmental Earth Sciences 71, 3907-3919.
Oze, C., Fendorf, S., Bird, D.K., Coleman, R.G., 2004. Chromium geochemistry of serpentine soils. International Geology Review 46, 97-126.
Stephen, M.T., James, A.J., 2004. Overview of chromium (VI) in the environment. Chromium (VI) Handbook. CRC Press, pp. 21.