Relationship between geological materials and selenium concentration on groundwater in a gold mine (Boinás, Asturias)

D. BARAGAÑO[1], E. BERREZUETA[2], E. FERNÁNDEZ[3], J.R. GALLEGO[1]

[1] INDUROT and Environmental Biotechnology and Geochemistry Group, University of Oviedo, C/Gonzalo Gutiérrez Quirós s/n, 33600 Mieres, Asturias, Spain

[2] Instituto Geológico y Minero de España (IGME), C/Matemático Pedrayes 25, 33005 Oviedo, Asturias, Spain.

[3] Orovalle Minerals S.L., Belmonte de Miranda, Asturias, Spain

Gold ores in skarns from the El Valle deposit (Asturias, Spain) are formed by two different Cu-Au skarn types, calcic and magnesian in the Cambrian limestones and dolostones. In the Skarn mineralization, Se is an abundant trace element. Due to the mining activity of the gold deposit, the drained water presents anomalous Se concentrations. The objetives of this work were to i) define the relationship between the mineralogical and geochemical composition of the rocks and the presence of Se in water, and ii) determine the leaching potential of Se in the materials of study.

The experimental design consisted on the following phases: i) Sampling of rocks and water; ii) Mineralogical characterization by optical and scanning electron microscopy and geochemistry by electron microprobe and ICP-MS of rock samples; iii) Water geochemistry; iv) Mobility of potential pollutants through leaching tests; v) Multi-component interpretation of results.

The results showed that in the three studied boreholes, the highest Se concentrations (0.7 ppb) detected in water samples correspond to fractured limestone with disseminated sulfurs (i.e. arsenopyrite and tellurides, selenides, and Bi-sulfosalts group of minerals). Calcic and magnesian skarn did not drain groundwater when drilled, however laboratory tests using distilled water revealed a concentration of 6.6 ppb Se in the leached for magnesic skarn material (total Se in the rock: 1.5 to 67 ppm) whereas Se was not detected for the calcic skarn (total Se in the rock: 0.5 to 1.9 ppm). In the case of limestone with disseminated mineralization (total Se in the rock: 0.1 to 1.2 ppm), the release of Se reached notable values of 5.4 ppb.

The methodology and results obtained have allowed determining that the main sources of Se in water are the disseminated minerals present in the limestone, where 5% of total Se in the rock is readily mobile.