

Concentrations and behaviors of I and Br in soil-plant systems

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Iodine Behaviour in Terrestrial Environment

It is well known that dry and wet deposition from the marine environment is an important source of I and Br into the terrestrial environment. Methylation of these elements, which are ozone-depleting substances, can occur in certain terrestrial plants, so that their behavior in the terrestrial environment is of special interest in soil-plant systems. We developed a simple method to measure I and Br in soil and plant samples by ICP-MS. Tetramethyl ammonium hydroxide was used to extract I and Br from these samples under relatively mild condition (60°C).

Concentrations of I and Br and Crop Uptake

The method can successively recover ca. 100% of I and Br from soil and plant samples. Using the method, we measured 92 paired samples of crop and soil. The relation between I and Br concentrations in the upland field and paddy field soil samples is shown in Figure 1. Concentrations of I and Br were highly correlated in both upland fields and paddy fields showing $r=0.86$ ($p<0.001$) and $r=0.84$ ($p<0.001$), respectively. However, I and Br concentrations were low in paddy field soils, possibly because the fields were covered with water during rice planting period which can cause low redox conditions. Plant uptake behavior of I and Br will be discussed.

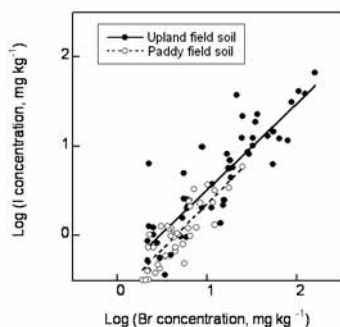


Figure 1: Correlation between I and Br concentrations in agricultural soils.

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Nanogold and its bearing on “invisible Gold” in sulfides

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Natural gold shows a great variety of forms and size, mainly due to its high chemical stability and mechanical coherence. In addition to macro- and microgold it was shown that nanogold might also exist, as a supplementary alternative to the “invisible gold”, supposedly substituting for As and Fe, e.g. in arsenopyrite (see [1] and many others thereafter). Nanogold forms both spherical, isolated grains and coral-like aggregates, several nanometers and tens of nanometers in size, respectively [2]. It was first detected on grain surfaces of nearly all the sulfides present in some small-size shear-zone related gold ores in metamorphics, however with a preference for arsenopyrite and pyrite.

The nanogold was identified by using a combination of physical methods, i.e. TEM/SAED, HRTEM and NGR (Mössbauer), following careful electron microscopic investigation on selected samples. The distribution of nanogold seems to be aleatory, following its apparently random distribution in all the ore types. However, the selectivity of nanogold seems to be related to crystalchemical features of host sulfides: arsenopyrite with different Fe/As ratios, As-bearing varieties of pyrite, pyrrhotite (a typical non-stoichiometric compound) and chalcopyrite (proved by NRG to contain both bivalent and trivalent iron). Such features obviously allow n and p junctions at the grain boundaries to appear, i.e. ideal loci for nanogold (seemingly with residual electrical charges like nearly all the nanomaterials) to concentrate.

Nanogold is seemingly refractory to majority of technological recovery processes. In an ongoing project undertaken at the University of Bucharest concerning phytorecovery of gold from geological materials with low to very low gold contents, is currently investigated the availability of gold to plants concentration, supposedly at a maximum for nanogold.

[1] Cathelineau *et al.* (1989) *Econ. Geol. Monograph* **6**, 328-341, [2] Udubasa *et al.* (1996) *Progr. & Abstr. 6th Seeheim Workshop on Mössbauer Spectroscopy*, 2006 Seeheim, Germany, Section **C-19**.