Crystallographic relationships between diamond and its olivine inclusions

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Modern single-crystal X-ray analysis of minerals still encapsulated in diamond not only permits the determination of both the chemical composition of inclusions and of the residual internal pressures [1], but also provides a three dimensional analysis of the crystallographic relationships between inclusions and diamond hosts. Although the syngenicity of inclusions in diamonds is generally assumed on the basis of strong morphological criteria, the crystallographic relationships between inclusions and their host are rarely determined and a systematic survey of them for the different mineral species is lacking. We will present results of an on-going single-crystal X-ray diffraction study of olivines included in diamonds from the Udachnaya kimberlite (Russia). Implications on the syngenetic or protogenetic nature of the inclusions will be discussed.

[1] Nestola, Nimis, Ziberna, Longo, Marzoli, Manghnani, Fedortchouk (2011) *Earth & Planetary Science Letters* **305**, 249–255.

Size dependent element interaction and speciation in environmental nanoparticles

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Environmental nanoparticles play an important role e.g. in the binding of trace metals [1]. Increasing evidence is found that material <20 nm, such as natural organic matter (NOM) and Fe-rich mineral-like nanophases, play a key role in the fixation of trace elements in many natural systems, including soil and peat bog systems.

Size Exclusion Chromatography (SEC) and Flow Field-Flow Fractionation (FlowFFF), both coupled to ICP-MS, are used as complementary high-resolution size separation techniques, providing size dependent element information. In the < 30 nm fraction of natural waters we observe NOM and Fe-rich mineral-like particles with significantly different affinities to trace elements. The presence of Fe-rich nanoparticles governs the binding of e.g. Pb, Ti, and Mn. Cu is predominantly associated with NOM.

While the complexation of inorganic As with NOM and Fe-minerals has been investigated previously, a particular focus of this work is their interaction with organic As species. We observe that substantial fractions of As are associated with low molecular weight NOM (Figure 1) despite the reported high affinity of Fe minerals for As binding [2].

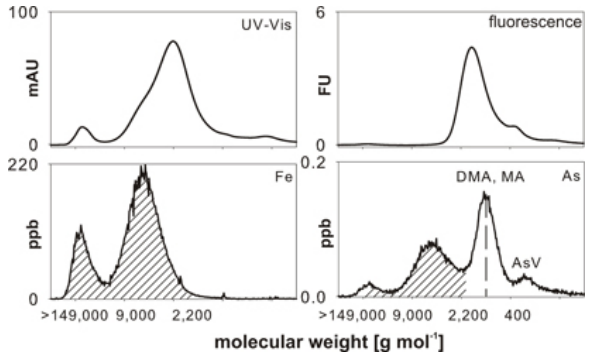

Figure 1: Size exclusion chromatogram of a peat bog drainage.

Combined FlowFFF/SEC size fractionation and IC speciation analysis can show, however, that some of the fractions are not colloid-bound but present as organic As species such as DMA and MA, as well as inorganic As (V).

[1] Hassellöv & von der Kammer (2008) *Elements* **4**, 401–406. [2] Sharma et al. (2010) *ES&T*. **44**, 4479–4485.