Geochemical controls on metal accumulation in Thames Estuary eels

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Estuaries are important environments for the fisheries industry, but often are zones of high heavy metal discharge. The major sinks of metals in estuaries are sediment, water and biota. The sediments themselves are not in stasis and are subject to many physical, chemical and biological processes that can release the metals into pore waters and the overlying water column, from which they are absorbed by the inhabitants of the estuary. Knowledge of the concentrations, forms and stabilities of metals in estuarine water and sediment is therefore critical in developing an understanding of the geochemical controls on metal accumulation in estuarine biota such as eels.

The European Eel (*Anguilla anguilla*) that inhabits the Thames Estuary, UK, is particularly susceptible to uptake of heavy metals from sediment as it feeds on epi- and shallow infauna within bottom sediment, and semi-hibernates in holes and sheltered parts of the riverbed during winter months. Although the Thames does not support large amounts of heavy industry along its banks, it does accommodate considerable light industry including shipping traffic, manufacturing, oil refineries and sewage works. These, combined with urban runoff from the Greater London area, constitute a variety of diffuse and point sources of metal pollution into the Thames Estuary that are available to the European Eel.

Thames sediment exhibits a range of heavy metal concentrations (Pb 7.6-710 mg kg^{-1}, Ni 10-273 mg kg^{-1}, Zn 34-2800 mg kg^{-1}, Cu 9-1100 mg kg^{-1}; n=25). Some of these are extremely elevated above background, and are related to specific point sources such as sewage treatment plants. By contrast, dissolved concentrations of metals in Thames water are low (Pb 0.01 – 0.2 mg l^{-1}, Ni 0.01-0.035 mg l^{-1}, Zn 0.02-0.03 mg l-1, Cu 0.004-10 mg l-1; n=25). Concentrations of metals in eel liver (Pb <0.04-13.7 mg kg^{-1}, Ni <0.005-1.0 mg kg^{-1}, Zn 18-106 mg kg^{-1}, Cu 4.3-62.5 mg kg^{-1}; n=128) are generally higher than those in muscle (Pb <0.04-12 mg kg^{-1}, Ni 0.14-2.1 mg kg^{-1}, Zn 6.1-50.6 mg kg^{-1}, Cu –0.5-4.5 mg kg^{-1}; n=128), although elevated values are seen in both.
These data will be integrated and used to predict the stability of metal sinks within the estuary, with reference to metal bioavailability to the European Eel.

Morphological Characteristics of Fluorite Crystals from Mecica Mines in northern Slovenia

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Examinations of secondary minerals from Srce district revealed a presence of flourite crystals as a new member of mineral association in the zinc-lead deposit of Me_ica. Fluorite appears in small transparent crystals and is associated with tan coloured smithsonite. The prevailing form of the fluorite crystals is cube {100} that is modified by rhombododecahedral {110} and hexakisoctahedral {hkl} faces. _trucl[1] reported on the occurrence of idiomorphic fluorite grains included in metasomatic galena associated with sphalerite and carbonate from Moring district.

The occurrence of fluorite in Srce district is a new find, and according to their crystal forms we anticipate a low-temperature hydrothermal formation.[2] Rhombododecahedral morphology indicates the temperature between 100-200°C.

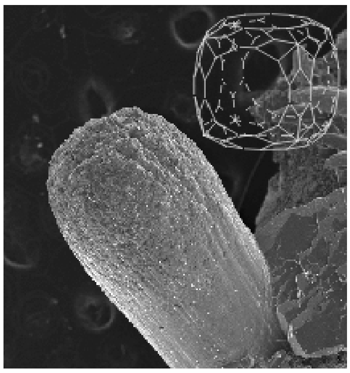

Figure1: SEM micrograph of fluorite crystal associated with fan-like smithsonite from Srce district.

References

[1] _trucl I., (1984), Geologija 27, 215–327.
[2] Kiryanova E.V. and Glikin A.E., (1999), *Journal of Crystal Growth* **198/199,** 697–703.