Investigation on the origin of Se-rich soils and selenosis in Yutangba, China

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Yutangba was known as a typical high-selenium (Se) area in China where a sudden incidence of human Se poisoning occurred in 1963. The surface exposed Se-rich carbonaceous cherts and carbonaceous shales (locally known as stone coal) of the Permian Maokou and Wujiaping formations at north part of Yutangba were generally considered as the major source of Se that was enriched soils in Yutangba and other places in Enshi Prefecture. However, little study has been conducted to confirm the source of Se in soils of Yutangba, and the causes of the sudden incidence of human Se poisoning was still in debate so far (Zhu *et al.* 2004).

161 soil samples were collected from the entire Yutangba area. Abnormal Se content was observed in 11 soil samples with Se concentrations ranging from 346 to 2018mg/kg with an average of 899±548 mg/kg. Selenium fractionation was investigated in 3 of them based on the sequential extracition protocol described by Kulp *et al*. (2004), which showed that elemental Se extracted by 1mol/L Na_2SO_3 was the predominant fraction (>90%) while other fractions are a few percent. These abnormal soil samples were further studied using SEM with EDX for elemental Se. Native Se crystals were discovered and they were surprisingly well preserved mainly as cubic-prismatic in form and more than 20μm in size (ground soil powder). These morphological characteristics are very similar to that of reported native Se crystals derived from natural burning of stone coal on the subsurface of abandoned stone coal spoils, but significantly different from the elemental Se formed by bacterial. This result indicated that the source of Se in cropland soils was different from that of soils which was not cultivated or disturbed by human activities. It provided the strong evidence that local people ever baked soil on the Se-rich stone coal fires and then they dispersed these baked soils containing much more higher dissoluble Se and insoluble native Se over the cropland to fertilize soil. This cultivated practice, ever used by villagers lived in Yutangba and other high-Se areas in Enshi, introduced abruptly a large amount of Se into their cropland, which is further accumulated in local people's food chain. The occurrence of native Se crystals in Yutangba cropland soils explains the source of Se in soils and the reason for the sudden incidence of human Se poisoning in 1963.

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References

Zhu, J.M. *et al.* , (2004), *Applied Geochemistry.* **19**, 461-467.
Kulp, T.K. and Partt, L.M. (2004), *G.C.A.* **68**, 3687-3701.

Sn/W-bearing A-type granites in Nanling Range, South China

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There exists an early Yanshanian (J_1-J_2) Sn/W-mineralized A-type granite belt in Nanling Range. South China. It extends from Huashan, Guposhan, through Jiuyishan, Qitianling, Qianlishan up to Xitian in a NE direction for some 400 km. The total granite exposure area is over 3000 km^2.

These granitic bodies are accompanied with the contemporary dioritic and monzonitic stocks and rhyolitic volcanics. The mafic microgranular enclaves with magma mixing features are very common. In general, the granitic bodies can mostly be divided into two intrusive phases: the coarse-grained major phase (mainly 163~156 Ma) and the fine-grained later stage additional phase (mainly 143~151 Ma).

The granite rocks are very acidic in composition, (SiO_2=67.89~77.11%), rich in K_2O (3.99~6.29%) and alkalies (K_2O+Na_2O=7.38~9.62 %), slightly meta-aluminous to weakly peraluminous (ACNK=0.92~1.10).

In trace elements, all the major phase granites and the contemporary intermediate stocks and mafic enclaves are enriched in Rb, Cs, U, Th, LREE, Y, Nb, Ta, Zr, Hf, Ga etc LILEs and HFSEs, as well as Sn/W. They belong to aluminous A-type granites. Compared with the major phase granites, the later stage granites are more acidic (SiO_2>76%), more alumina-saturated (ACNK=1.00~1.21), and more enriched in Rb, Cs, U, Th, Y, Sn, W etc. trace elements, but relatively depleted in LREE, Zr etc. HFSEs. These later stage granites are often Sn/W-mineralized with large even giant tonnage. Chemically these rocks are very close to S-type granites.

The J_1-J_2 time in Nanling Range region was a post-orogenic extensional geotectonic setting. Upwelling of the asthenospheric mantle along the NE-trending deep faults resulted in melting of lower crust. The mantle fluid/melt may bring in Sn/W etc. ore-forming elements and mobilize them from the basemental rocks. The higher back-ground Sn/W concentration in melted protoliths and well evolved fractionation of granitic melts are also necessary prerequisites for formation of industrial Sn/W deposits.