Apatite from eclogite and veins from Sulu-Dabie eclogite-bearing belt

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We analysed apatites of eclogites and veins hosted in eclogite bodies in Chizhuang, Qinlongshan, Maobei from the Sulu ultrahigh-pressure (UHP) belt, and Bixiling, Maowu, Hualiangtin, Zhujiachong from the Dabie Mountains in order to unravel whether or not saline as a predominant fluid type was involved in high-pressure (HP) or UHP metamorphic process.

The apatites in eclogites have the Cl contents of 0.01-2.0 wt % from Chizhuang, 0.04-0.36 wt % from Qinlongshan, 0.04-0.6 wt % from Maobei, 0.2-1.5 wt % from Bixiling, 0.01-7.0 wt % from Maowu, and 0-0.05 wt % from Hualiangtin and Zhujiachong. The results suggest that the fluids equilibrated with apatites were from very low salinity (Hualiangtin and Zhujiachong) to very high salinity (Chizhuang, Bixiling and Maowu). At the same time, for one sample or outcrop of eclogite, large variability of Cl content in apatites also indicates that the salinity of fluids was greatly changed during HP or UHP metamorphic process.

The apatites in veins from Chizhuang, Maobei, Bixiling, Hualiangtin and Zhujiachong were also analysed. The apatites of kyanite (Ky)-zoisite (Zo)-quartz (Qtz) vein from Chizhuang have Cl content of 0-1.7 wt %, whereas the apatites from other three types of vein (Qtz vein, omphacite (Omp)-rich-Qtz vein and phengite (Phn)-rich-Qtz vein) show less 0.20 wt % Cl content. The apatites of three types of veins from Maobei (Omp, Ky-Qtz and Zo-Qtz) display 0-0.36 wt % Cl contnets. Two types of veins from Bixiling (Omp and Ky-Phn-Qtz) have the apatites with 0.2-1.0 wt % Cl contents. The apatites of epidote-talc-Ky-Qtz vein from Hualiangtin show 0.02-0.30 wt % Cl content, and of Phn-Qtz and Zo-Ky-Qtz veins from Zhujiachong have less 0.05 wt % Cl content. These analytical data indicate that the fluids equilibrated with apatites were also from very low salinity (Zhujiachong) to very high salinity (Chizhuang, Bixiling). Meanwhile, for one vein, significant variability of Cl content in apatites also indicates that the salinity of fluids was greatly variable during the formation process of vein.

Adsorption of thallium(I) onto geological materials: Effect of pH and humic matter

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Thallium (Tl) is a typical toxic heavy metal, with higher toxicity than Hg, Cd, Pb. Anthropogenic sources such as coal combustion or mining/smelting activities generated high enrichments of Tl in some areas. For long-term risk assessments, the mobility in geochemical systems is a topic of major interest. Adsorption onto mineral surfaces can be considerably affected by dissolved humic acids (HAs), which are ubiquitous in natural waters. By using radioactive tracers, we were able to investigate co-adsorption of Tl and HAs at low concentration levels to be considered in real scenarios [1].

Two natural HAs were extracted from river sediments collected in a contaminated mining area in South China (regions of Guangzhou and Yunfu City). They were radiolabeled by an azo-coupling reaction with ^{14}C-aniline. ^{204}Tl (I) was employed as a radiotracer for Tl (I). The geological materials used in this study were goethite, pyrolusite and a natural sediment sample taken from Yunfu City.

For all these substrates, metal adsorption was found to be promoted with increasing pH since more binding sites are provided by deprotonation of surface hydroxyl groups. In contrast, adsorption of HAs was counteracted with increasing pH, which is explained by increasing electrostatic repulsion as a consequence of deprotonation. As expected, the extent of Tl (I)-HA complexation turned out to be very low, with a slight increase at higher pH.

Based on these data, a combined distribution model (Linear Additive Model) was tested for suitability in predicting the pH-dependent influence of HAs on Tl (I) adsorption. Our experimental results could not be reproduced in this way. In view of the fact that the approach worked well in other studies, criteria for its applicability need to be identified. Selectivities within the multicomponent system of humic material, regarding adsorption as well as complexation, are one possible reason for a failure of the model.

[1] Liu J. Lippold H. Wang J. Lippmann-Pipke J. & Chen Y.H. (2011) *Chemosphere* **82** 866–871.