

Selenium speciation of Se-rich rocks from Yutangba of Enshi, China

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The toxicity, mobility and bioavailability of selenium are controlled by chemical speciation in the environment. The determination of Se speciation is a key aspect to understand its potentially environmental consequence. Yutangba was a typical high-Se area in China where a sudden incidence of human Se poisoning occurred in 1963[1]. The surface exposed Se-rich rocks of the Maokou and Wujiaping Formations were generally considered to be the main source of Se that was enriched soils of Yutangba and other places. However, little is known about the Se speciation trends in Se-rich rocks which distributed in Yutangba, China.

Se-rich rocks in Yutangba mainly include carbonaceous chert, carbonaceous mudstone, siliceous carbonaceous shale and carbonaceous shale (locally known as “stone coal”), in which Se content (113.6-26054mg/kg) varies from different rocks type but “stone coal” with the higher Se whose average is more than 1853mg/kg. Se speciation in carbonaceous chert, shale and mudstone of Yutangba was investigated based on the sequential extraction protocol described by Dr. Johnson and Kulp[2]. Base soluble Se extracted by 0.1mol/L NaOH is the predominant form of Se present in all above three rocks and Se(IV) is significantly greater proportion than organic-Se. Distinctive variations in other forms were also observed between different rock types. Ligand exchangeable and sulfide/selenide associated Se have a similar distribution in carbonaceous chert and shale while residual and elemental Se is a little. But for carbon-bearing chert ($\text{SiO}_2 > 90\%$) in which the total Se is lower (113.6-115.9mg/kg) while the proportions of residual and elemental Se is greater than that of exchangeable and sulfide/selenide associated Se. In carbonaceous mudstone, smaller native Se particles can be easily found under SEM, elemental and exchangeable Se are greater proportion than residual and sulfide/selenide associated Se, which shows currently geochemical weathering condition of Yutangba is favorable for Se mobilization and re-deposition as secondary native Se in suitable position such as interbedded mudstone layer.

Our results support that Se was highly associated with organic matter. Adsorption of Se(IV) by organic matter in carbonaceous Se-rich rocks plays an important role in the weathering process of Se-rich rocks in Yutangba.

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References

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- [2] Kulp T.R. and Pratt L.M. (2004), *GCA* 68, 3687-3701.