

Rb-Sr isotopic dating and its genetic significance to the Manaoko gold deposit, NW-Sichuan, China

S.H. FU¹ AND X.X. GU²

¹ Chengdu University of Technology, Chengdu, P.R. China (sh-fu@263.net)

² Institute of Geochemistry, Chinese Academy of Sciences, Guiyang, P.R. China (xuexiang_gu@263.net)

Introduction

The Manaoko deposit, hosted in Triassic turbidites, is a typical micro-disseminated gold deposit. With respect to its genesis, different models have been advocated. However, there is still much controversy about the timing of mineralization.

Mineralization at Manaoko occurs commonly as sheetlike bodies with distinct layering that is consistent with bedding of the host rocks. Main ore minerals include pyrite, realgar, stibnite, and arsenopyrite.

In order to constrain the timing of mineralization, Rb-Sr isotopes were measured for fluid inclusions in quartz.

Results and discussion

Rb and Sr contents in five quartz samples range from $0.731\text{--}2.702 \times 10^{-6}$ and $2.590\text{--}16.700 \times 10^{-6}$, respectively. The calculated $^{87}\text{Rb}/^{86}\text{Sr}$ and $^{87}\text{Sr}/^{86}\text{Sr}$ values vary between 0.433–1.765 and 0.71010–0.71387, respectively. The initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of the fluids (0.7085) is consistent with the $^{87}\text{Sr}/^{86}\text{Sr}$ ratio of seawater (0.7090). The data outline an isochron age of 210 ± 11 Ma.

The Rb-Sr isotope data show that gold mineralization at Manaoko is coeval with deposition of the host sedimentary rocks. It is thus suggested that submarine sedimentary exhalative processes were responsible for formation of the deposit, accompanied by deposition of the host turbidites. Gold and associated metals were introduced by episodic exhalation of metalliferous basinal brines.

Conclusions

The timing of gold mineralization at Manaoko is consistent with deposition of the Triassic turbidites. The deposit is defined to a sedimentary exhalative (sedex) type and is similar to the recently discovered gold occurrences in the Carlin trend (Emsbo et al., 1999).

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References

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Sorption of As(V) on schwertmannite and its effect on the transformation

K. FUKUSHI,¹ T. SATO,² AND N. YANASE³

¹Graduate School of Natural Science and Technology, Kanazawa University, Kanazawa, Japan (fukushi@earth.s.kanazawa-u.ac.jp)

²Institute of Nature & Environmental Technology, Kanazawa University, Kanazawa, Japan (tomsato@earth.s.kanazawa-u.ac.jp)

³Department of Environmental Sciences, Japan Atomic Energy Research Institute, Tokai-mura, Japan (yanase@sparclt.tokai.jaeri.go.jp)

Introduction

At abandoned arsenic mine in Nishinomaki, Japan, water discharged from mining and waste dump area is acidic and rich in arsenic. However, arsenic in the drainage is naturally attenuated due to the sorption by the ochreous precipitates, mainly composed of schwertmannite. In the present study, synthesized schwertmannite were prepared and served for the batch sorption experiment in order to examine the mechanism of arsenate sorption. Moreover, the alteration experiment of the specimen with different arsenate content was performed to determine the role of arsenate sorption on transformation of the schwertmannite in order to understand the long-term behavior of arsenic sorbed into schwertmannite.

Experimental methods

Sorption of arsenate in the schwertmannite suspension was examined as a function of arsenate concentrations (10^{-7}M – 10^{-3}M). The suspension pH was adjusted with HNO_3 to 3.2–3.4. After 24 hours, the suspensions were filtered. The solutions were provided for the analysis of Fe, As and sulfate. The reacted solids were examined by infrared spectroscopy.

The samples contained arsenate of 0–1.0 mmol/g were prepared by the batch sorption procedure. The samples were spread onto the glass slide, dried and then placed on the airtight containers in which condition was kept vapour pressure at 50 °C. The samples after aging were characterized by X-ray diffractometry.

Results and discussion

The result of arsenate sorption experiment showed that schwertmannite sorbed arsenate up to 80 mg/g, and that the structural sulfate in schwertmannite was released to solution in response to the arsenate uptake. The result of alteration experiment showed that the schwertmannite with little arsenate transformed to crystalline iron phase after a week. On the other hand, no change in XRD patterns was observed in the samples with much amount of arsenate. The difference indicates that the transformation of schwertmannite is significantly retarded by arsenate sorption. By inhibition of the transformation, the attenuation process of arsenic in ochreous precipitates is irreversible in overall and expected to be maintained for long-term.