Arsenate, chromate and selenite sorption on schwertmannite

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Aim of this Study

Schwertmannite is a main precipitated phase identified in acid mine drainage (AMD). Sulfate in schwertmannite can be exchanged by other oxyanions such as arsenate and chromate in AMD [1]. Therefore, the sorption of other oxyanions on schwertmannite is very important because this reaction can control the fate of those oxyanions and eventually the toxicity of dainage waters. The sorption reaction of toxic ions on high surface minerals is also a matter of great concern due to potential usage in environmental remediation.

Materials and Methods

Schwertmannite was synthesized by the reacton of 1L of solution containing 10g $FeSO_4$ and 5mL H_2O_2(30%) for 24 h. The sorption experiment was conducted at pH 4, 25°C for 24h. Synthetic schwertmannite was reacted in 100ml solution with various concentrations of AsO_4^{2-}, SeO_3^{2-}, and CrO_4^{2-}. After the reaction the solution was centrifuged and the concentrations of oxyanions were anlayzed by AA. The thermal properties of exchanged schwertmannite were also analyzed by DTA and TG to investigate the stability of these mineral phases.

Results and discussion

At 1.0mM and lower concentrations, arsenate and selenite showed 100% sorption. Arsenate and selenite also reached their maximum sorption capcity within 24 hours. However, only 40-80% of chromate was sorbed at the same concentrations. Chromate did not reach its maximum sorption capacity either. These results indicate different sorption kinetics among these oxyanions.

DTA and TG analyses show that arsenate-sorbed sample has similar thermal property to pure schwertmannite. However, chromate show different characteristics from other oxyanions, indicating that sorption kinetics are also related to the oxyanion stability on schwertmannite.

[1] Fukushi *et al*. (2004) *Am Mineral* **89**, 1728-1734.

Compositional and textural evidence for magma mixing documented in plagioclase phenocrysts at Mt. Bidkhan, Iran

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Mount Bidkhan stratovolcano is located in the Central Iranian Volcanic Belt and contains Pliocene high-K calcalkaline andesitic and dacitic volcanics. The mineral assemblage is plagioclase, clinopyroxene, orthopyroxene, amphibole and biotite. Plagioclase is the most abundant phase in all of the rocks, and records textural and chemical variations, possibly revealing some stages of evolution for Mt. Bidkhan magmas. From field evidence, enclaves and banded rocks, different in their colour, indicate that mixing and mingling may have occured before eruption. In addition, features such as sieved and oscillatory zoned plagioclase, and the coexistence of several types of plagioclase phenocrysts within the same sample, are other indications of magma mixing and mingling processes. Based on textural and SEM-EDS analyses, several types of plagioclases, different in their composition, have been found in these rocks, evidence of an effective role of mixing and hybridization. Types of plagioclase recognized are the following: 1) oscillatory zoned plagioclase (ΔAn of oscillations ~5mol%) from core to rim; 2) normally zoned plagioclase (up to 75 An mol% at the core); 3) reversed zoned plagioclase (with 30 An mol% at the core and 50 An mol% at the rim); 4) oscillatory zoned plagioclase, with decreasing An mol% from core to rim; 5) reversed oscillatory zoned plagioclases, with increasing An mol% from core to rim. In addition to phenocrysts, rather homogeneous plagioclase microlites occur in the groundmass. The integrated analysis of textural and chemical data allows to establish that magma evolution was chiefly ruled by fractional crystallization processes at shallow depth, joined to repeated episodes of mixing due to inputs of less evolved magmas.