Sorption of Pb(II) on K-jarosite and As-jarosites

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Jarosite (Js), $[KFe_3(SO_4)_2(OH)_6]$ is a secondary mineral that forms in mine-related wastes and is important for its contaminant sequestering capabilities under acid conditions. To date, several studies of As(V) incorporation into the Js structure, replacing SO_4^{2-}, have been reported [1,2], but few of cationic incorporation/retention, and especially not of the simultaneous uptake of arsenic and heavy metal cations. The goal of the present work is to investigate the sorption mechanism of Pb(II) on both pure K-Js, and As-Js $[KFe_3(SO_4)_{2-z},(AsO_4)_z)\ (OH)_6]$ with As(V) molar contents of 6% and 12% with respect to the SO_4^{2-} position (z= 0.12 and 0.24, respectively). Pb(II) may potentially substitute for the K^+ position (together with H_3O^+) in the Js structure [3].

Pb(II) was added either during (As-)Js synthesis or after its formation at pH 2. Wet-chemical experiments, thermo-dynamic modeling, attenuated total reflectance - Fourier transform infrared and X-ray absorption spectroscopies, as well as X-ray diffraction were employed to determine the Pb(II) sorption behavior and mechanisms involved. Pb(II) additions after (As-)Js formation showed a slow Pb(II) uptake and a synergistic sorption capacity with As(V) content in the Js, with values ranging from 50 to *ca*. 200 mmol Pb(II)/kg Js.

The sorption mechanism that takes place when the (As-)Js samples are exposed to Pb(II) is mostly via surface precipitation; whereas in the cases where Pb(II) was added during (As-)Js formation, a considerable proportion of Pb(II) was incorporated into the (As-)Js structure, but more than one solid phase was produced simultaneously.

[1] Paktunc & Dutrizac (2003) *Can. Mineral.* **41**, 419–905 [2] Savage *et al.* (2005) *Chem. Geol.* **215**, 473-498 [3] Smith *et al.* (2006) *Chem. Geol.* **229**, 344-361.