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ATR-FTIR spectroscopic characterization of ferric arsenic-containing colloid and gypsum

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ABSTRACT

This study chose a typical arsenic and iron-containing sediments sampled from the Shimen realgar mine for the purpose of investigating the centrifugation on the separation of the colloid and crystalline components. The effect was characterized by using an *in-situ* attenuated total reflection Fourier transform infrared (ATR-FTIR) spectroscopic method. The sediments were firstly characterized by XRD, SEM-EDX, XPS and *in-situ* FTIR. XRD and SEM results showed that the sediments were made of arsenic iron-containing colloid and crystalline gypsum. Infrared bands at 790 and 872 cm^{-1} were assigned to the symmetric stretching vibrations of As-O. The binding energy of XPS for Fe_{2p} and As_{3d} were 713 and 45 eV, respectively, indicating the Fe was trivalent and As was pentavalent. Then, the colloid and crystalline components were separated by different centrifugal speeds (from 0 to 11000 rpm). Obvious increase in the characteristic peak intensity at 1113 cm^{-1} with increasing centrifugal speed was observed. Centrifugation at 8000 rpm was the best threshold to separate the colloid and gypsum. Therefore, centrifugation combined with ATR-FTIR spectroscopic technique might be regarded as a feasible mean to give both quantitative and qualitative information on the separation performance, which might be benefit to reduce mine wastes and establish a feasible pre-treatment scheme for future arsenic treatment.

Keywords: Arsenic; Colloid; Gypsum; Centrifugation; ATR-FTIR

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