Effects of concentration of oxyanions and aging time on the precipitaion of jarosite

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Jaoriste has been known to coprecipitate with other oxyanions, and therefore, the precipitation of jarosite can affect the behaviors of oxyanions in acid mine drainage. Our experiment shows that pure jarosite and jarosite with oxyanions can easily precipitate at room temperature and that the species and concentrations of oxyanions affects greatly on the coprecipitation of jarosite. We used 2, 5, and 10 mole% of oxyanions in solution as a starting solution and 1 and 6 hours, and 1, 3, 10, 20, and 40 days were used as aging times.

The concentration of oxyanions and aging time mainly influence the precipitaion rate and crystallinity of jarosite. Decreasing oxyanions and increasing aging time generally increase the precipitation rate and crystallinity of the coprecipitated jarosite. It takes at least one day to precipitate and show full jarosite XRD peaks. The precipitation rate is different for each jarosite with oxyanions, and jarosite with AsO_4 shows the slowest precipitation rate and lowest crystallinity while those with CrO_4 and SeO_4 show the fastest precipitation and high crystallinity. At initial stage, all oxyanions are preferred to precipitate in amorphous phases, especially for the jarosite with slow precipitation rate, indicating that amorphous phase, probably amorphous iron oxyanions phase such as scorodite ($FeAsO_4$) precipitates rapidly. However, the amorphous phases precipitating with oxyanions which coprecipitate with jarosite fast contain much lower concentration of oxyanions and have chemical composition close to the starting solution composition probably due to the fast precipitation of jarosite with those oxyanions. Even though, in a field, a large amount of arsenic is reported to be incorporated in jarsoite, the behavior of CrO_4 may be more significantly influenced by the coprecipitaion of jaoriste than other oxyanions.