Investigation of the alunite-natroalunite solid solution and Na-K exchange between solid and solution at 250ºC

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We investigated the alunite $KAl_3(SO_4)_2(OH)_6$-natroalunite $NaAl_3(SO_4)_2(OH)_6$ solid solution and Na-K exchange between solid and solution in experiments of two- and three-month duration at 250ºC. Synthetic starting materials of various compositions were reacted in 1M H_2SO_4 with various KCl – NaCl proportions at 1M concentration. X-ray diffraction determination of run products revealed the presence of a miscibility gap, the existence of which had been predicted on the basis of study of natural assemblages and some experiments. A natural natroalunite of composition Na_{63} decomposed to Na_5 to Na_{70}, the apparent limits of the miscibility gap. This is somewhat at variance with previous predictions, however, in agreement with predicted asymmetry.

The distrubution coefficient K_D for the exchange reaction $KAl_3(SO_4)_2(OH)_6 + Na^+ = NaAl_3(SO_4)_2(OH)_6 + K^+$ is defined as (X_{Na}/X_K) divided by (mNa^+/mK^+), where X is mole fraction in the solid and m is molality of the solution. Recovered run solution compositions were determined by flame AAS. The results yielded ln K_D increasing from -4.330 to 1.612 with inceasing X_{Na} in the solid, in reasonable agreement with previous results.

References

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Clay mineralogy, Kübler index and K-Ar ages of illite in Yinshan polymetallic deposit, Dexing, Jiangxi province, South China

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The Yinshan poly-metallic deposit is located 20km east of the Dexing large porphyry copper deposit, both are tectonically situated on the southeast margin of Yangtze craton, South China. It is a hydrothermal deposit which is closely related to the acidic-intermediate volcanic-subvolcainc rocks Late Jurassic. The clay minerals formed in the hydrothermal alteration mainly consist of illite, which was a result of illitization of feldspar during the fluid-rock interaction. The Kübler index of illite was closely associated with ore-forming fluids flow action. The nature, composition, fluid/rock ratios and fluid flow of ore-forming fluid restrict the forming of illite and the Kübler index of illite. In the first episode of Pb-Zn-Ag mineralization (130-136Ma), the fluid/rock ratios was relatively low, fluid flow was mainly by pore osmosis, and the solute transported slowly, the illite presenting a little swelling layers. In the second episode of Cu-Au mineralization (122-125Ma) fluid/rock ratios was relatively higher, and fluid flow was mainly through fractures or channels. The solute transported quickly, the illite presenting no swelling layers and have smaller Kübler index. The third episode (104Ma) have no economical mineralization, with a little amount of illite. It suggested that illitization and the bigger illite Kübler index were closely related to Pb, Zn and Ag mineralization, whereas chloritization and smaller Kübler index of illite related to Cu and Au mineralization. Therefore, the assemblages of clay minerals, the distribution, and the illite Kübler index are the indicators and clues to explore Cu, Au or Pb, Zn, Ag mineralizations in the district.

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