

## Solid-liquid equilibria in the aqueous subsystems of K-Rb-Cs-SO<sub>4</sub>-H<sub>2</sub>O

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Brines, containing a variety of useful components, such as alkali metal (IA), alkaline earth metal, are naturally occurring complex electrolyte solution. In sulfate type brine, potassium, rubidium, and cesium are easily formed into solid solution because of their similar ion radius: potassium,  $1.33 \cdot 10^{-10}$  m, rubidium,  $1.48 \cdot 10^{-10}$  m, and cesium  $1.69 \cdot 10^{-10}$  m, information on the solid solution aqueous solution equilibria is of a particular importance for the purification of chemical produces, trace element geochemistry and element cycles.

In spite of some paper described phase equilibria aiming at rubidium, potassium and cesium coexist system have been reported<sup>[1-3]</sup>, the relevant phase relations of the rubidium, potassium, cesium coexist system are lacking. Accordingly, the phase equilibria of three subsystems of K<sup>+</sup>, Rb<sup>+</sup>, Cs<sup>+</sup> // SO<sub>4</sub><sup>2-</sup> - H<sub>2</sub>O at (298, 323 and 348) K have been done by using isothermal dissolution method and Schreinemakers wet residues method. The stable phase diagrams of these three ternary system at (298, 323 and 348) K belong to complex type with solid solution [K, Rb]<sub>2</sub>SO<sub>4</sub>, [Rb, Cs]<sub>2</sub>SO<sub>4</sub>, [K, Cs]<sub>2</sub>SO<sub>4</sub> formed, respectively. And these three phase diagram consist of two invariant point, three univariant curves, and three crystallization zones corresponding to two single salts and one solid solution. The solid solution has the largest crystallization field almost occupies the entire phase region, and the crystallization zones of the solid solution decreased with the increase in the temperature, which indicate that the increment of temperature is conducive to separate single salts.

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