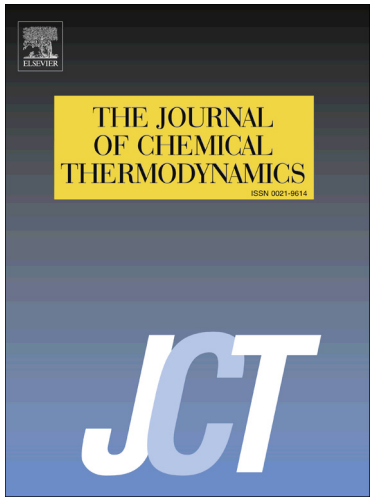

(Solid + liquid) phase equilibrium for the ternary system (K_2CO_3-Na_2CO_3-H_2O) at T = (323.15, 343.15, and 363.15) K

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(Solid + liquid) phase equilibrium for the ternary system (K_2CO_3-Na_2CO_3-H_2O) at T = (323.15, 343.15, and 363.15) K

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Abstract: In order to provide a theoretical basis and fundamental data for industrial utilization of insoluble potassium rocks to produce potassium salts, the phase equilibrium of the ternary system K_2CO_3-Na_2CO_3-H_2O at 323.15 K, 343.15 K and 363.15 K was determined using the isothermal dissolution equilibrium method. According to the experimental results of salt solubility, the phase diagrams were constructed and the crystallization zones are discussed in detail. All of the solubility isotherms at 323.15 K, 343.15 K and 363.15 K consist of two invariant points, three univariant curves and three crystallization fields corresponding to $Na_2CO_3 \cdot H_2O$, $K_2CO_3 \cdot Na_2CO_3$ and $K_2CO_3 \cdot 1.5H_2O$, respectively. The densities of the liquid phase of the ternary systems were investigated as well.

Keywords: Phase diagram, Solubility, Potassium carbonate, Sodium carbonate, Thermodynamic properties

1. Introduction

Potassium is an inorganic chemical raw material. The soluble potassium resource is the main source of potassium salts [1]. However, the distribution of soluble potassium resources is in serious imbalance all over the world, a few countries of the northern hemisphere (Canada, Russia, Belarus, and Germany) account for 93% of the world's total reserves [1, 2].

China depends more than 50% on import for potassium salts due to the lack of soluble potassium resources. However, the potassium containing rocks with the principal mineral of K-feldspar exist throughout the country and by using these valuable rocks to produce potassium salts, one can alleviate severe shortages of potash resources in China. We have done a series of investigations about comprehensive utilization of potassic rocks [3-8]. K-feldspar can be decomposed in the media of sodium hydroxide via hydrothermal treatment. The filtered liquors are