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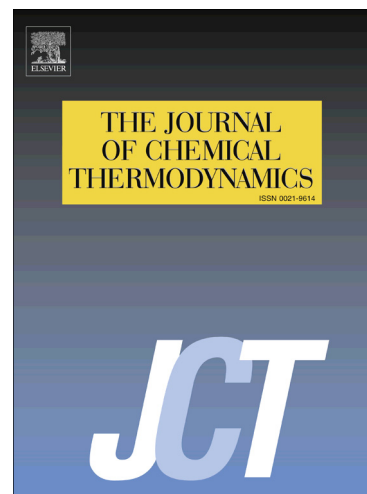
(Solid + liquid) phase equilibrium for the ternary system ($\text{K}_2\text{CO}_3\text{-Na}_2\text{CO}_3\text{-H}_2\text{O}$) at $T = (323.15, 343.15, \text{ and } 363.15) \text{ K}$

Congcong Yin, Meitang Liu, Jing Yang, Hongwen Ma, Zheng Luo

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(Solid + liquid) phase equilibrium for the ternary system**(K₂CO₃-Na₂CO₃-H₂O) at $T = (323.15, 343.15, \text{ and } 363.15) \text{ K}$** **Congcong Yin^{a,c}, Meitang Liu^{a,*}, Jing Yang^{a,b}, Hongwen Ma^{a,b}, Zheng Luo^{a,c}**^a *School of Materials Science and Technology, China University of Geosciences, Beijing 100083, China*^b *Beijing Key Laboratory of Materials Utilization of Nonmetallic Minerals and Wastes, China University of Geosciences, Beijing 100083, China*^c *Bluesky Technology Corporation, Beijing 100083, China*

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 K₂CO₃-Na₂CO₃-H₂O 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 Na₂CO₃·H₂O, K₂CO₃·Na₂CO₃ and K₂CO₃·1.5H₂O, 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

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