

WANG Chun, ZENG Ying and HE Zhiyi, 2014. Stable Phase Equilibrium of the Aqueous Ternary System $\text{Li}^+ // \text{Cl}^-$, borate - H_2O at 348 K. *Acta Geologica Sinica* (English Edition), 88(supp. 1): 377-378.

Stable Phase Equilibrium of the Aqueous Ternary System $\text{Li}^+ // \text{Cl}^-$, borate - H_2O at 348 K

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The Sichuan Basin, with an area of about $20 \times 10^4 \text{ km}^2$, is situated at $102.5^\circ \sim 110^\circ \text{ E}$ and $27.67^\circ \sim 32.67^\circ \text{ N}$. The underground brine resources in Sichuan basin are a type of comprehensive liquid mineral resource. Pingluo underground brine is famous for its high contents of potassium and boron. The K^+ and B^{3+} contents of Pingluoba underground brine are 53.267 g/L and 4.994 g/L, respectively (Lin et al, 2008). Besides, the brine is rich in I^- , Sr^{2+} , Li^+ , Rb^+ makes it possible to be high quality chemical materials. Therefore, the study of the phase equilibrium to guide the development of Pingluoba brine is of profound resource significance and great economic value.

Our project group has studied some subsystems of the complex system Li^+ , K^+ , Rb^+ , $\text{Mg}^{2+} // \text{Cl}^-$, borate - H_2O at 348 K (Liu et al, 2013; Yin et al, 2013; Yu et al, 2012; Yang et al, 2014). And the ternary system $\text{Li}^+ // \text{Cl}^-$, borate - H_2O is one subsystem of the complex system mentioned above. Till now, there is no paper reported the phase equilibrium of the system at 348 K. Accordingly, the phase equilibrium relationship of the ternary system $\text{Li}^+ // \text{Cl}^-$, borate - H_2O at 348 K was studied using an isothermal equilibrium dissolution method. The solubilities and physicochemical properties such as density, pH value, and refractive index of the system were determined.

On the basis of experimental date, the stable phase diagram of ternary system $\text{Li}^+ // \text{Cl}^-$, borate - H_2O at 348 K was plotted (Figure 1). The ternary system is of simple type and no double salt or solid solution found at 348 K. The phase diagram consists of one invariant point E, two univariant curves AE and BE, and two crystallization zones AECA and BEDB corresponding to single salts $\text{LiCl} \cdot \text{H}_2\text{O}$ and $\text{Li}_2\text{B}_4\text{O}_7 \cdot 3\text{H}_2\text{O}$. The experimental results show that LiCl has salting-out effect on $\text{Li}_2\text{B}_4\text{O}_7$ due to the

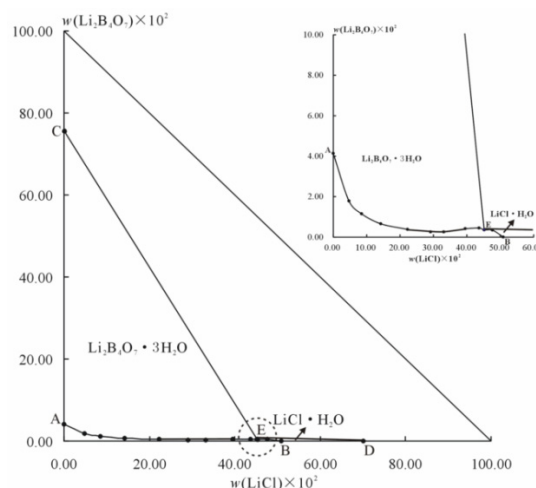


Fig. 1. Phase diagram of the ternary system $\text{Li}^+ // \text{Cl}^-$, borate - H_2O at 348 K.

common ion effect and hydration of Li^+ , it is that the solubility of $\text{Li}_2\text{B}_4\text{O}_7$ in the solution is declining with the increase of LiCl . The crystallization field of $\text{Li}_2\text{B}_4\text{O}_7 \cdot 3\text{H}_2\text{O}$ (AECA field) is greater, while the crystallization field of salt $\text{LiCl} \cdot \text{H}_2\text{O}$ (BEDB field) is smaller.

Key words: phase equilibrium, lithium, chloride, borate.

Acknowledgements

Project supported by China National Nature Science Foundation (No. 41173071), the Research Fund for the Doctoral Program of Higher Education from the Ministry of Education of China (20115122110001), the Sichuan Youth Science and Technology Innovation Research Team Funding Scheme (2013TD0005), and Innovation Team of CDUT(KYTD201405).

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