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The Phase Diagram of Lithium Salt Systems and Its Application in Extraction of Lithium from Salt Lake Brine

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At present, the extraction of lithium from salt lake brine is the new trend of the salt lake industrialization. The saltine lake lithium resources are extremely rich in western china, especially in Qinghai-Tibetan plateau. Brine of salt lakes on the Qinghai-Xizang Plateau are characterized by a high concentration of lithium and boron. These brine mostly belong to the complicated system Li^+ , Na^+ , K^+ , $\text{Mg}^{2+}/\text{Cl}^-$, SO_4^{2-} , $\text{B}_4\text{O}_7^{2-}\text{-H}_2\text{O}$. In preliminary evaporation stage, the concentration of lithium and borate is low. The classical phase diagram Li^+ , Na^+ , K^+ , $\text{Mg}^{2+}/\text{Cl}^-$, SO_4^{2-} can be used to guide the manufacture of salt lake. However, in the mid to late evaporation stage, with the incassation of lithium and borate ions, the influence of these ions cannot be ignored. According to the research, borate usually doesn't deposit in evaporation stage, but stays in concentrated brine. So, The phase diagram Li^+ , Na^+ , K^+ , $\text{Mg}^{2+}/\text{Cl}^-$, SO_4^{2-} can be used in this stage. In that quaternary systems, the double salt KLiSO_4 · $\text{Na}_3\text{Li}(\text{SO}_4)_2$ · $6\text{H}_2\text{O}$ is formed. By improving and updating salt pans technological route, KLiSO_4 · $\text{Na}_3\text{Li}(\text{SO}_4)_2$ · $6\text{H}_2\text{O}$ could be obtained in industrial production. Those lithium salts can be used as raw material for production of lithium carbonate products. Due to existing limitations of the salt lake brine itself and the local construction conditions, only those raw lithium salts could be processed at local, the further refined process takes place in other areas where are well-infrastuctured. This production idea has been confirmed in a salt lake in Tibetan plateau.

Key words: Phase Diagram, salt lake brine, lithium salts.

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