

盐卤硼酸盐化学 XIII:  $2\text{MgO} \cdot 2\text{B}_2\text{O}_3 \cdot \text{MgCl}_2 \cdot 14\text{H}_2\text{O}$  结晶动力学研究

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**摘要** 本发明对  $\text{MgO} \cdot \text{B}_2\text{O}_3 \cdot \text{MgCl}_2 \cdot \text{H}_2\text{O}$  浓盐溶液结晶析出氯柱硼镁石 ( $\alpha\text{MgO} \cdot \alpha\text{B}_2\text{O}_3 \cdot \text{MgCl}_2 \cdot 14\text{H}_2\text{O}$ ) 的动力学过程进行了研究, 利用单纯形优化法配合 Runge-Kutta 微分方程组数值解法对实验数据进行处理, 给出了结晶动力学方程, 并对硼在溶液中的存在形式进行了讨论, 提出了结晶反应机理, 同时考察了温度和氯化镁浓度对结晶速率的影响。

**关键词** [反应机理](#) [硼镁石](#) [硼酸盐](#) [氧化镁](#) [水合物](#) [氯化镁](#) [氧化硼](#) [结晶动力学](#) [微分方程](#) [动力学研究](#) [结晶速率](#) [龙格-库塔法](#) [单纯形普法](#)

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## Chemistry of borate in salt lake brine XIII: study on crystallization kinetics of $2\text{MgO} \cdot 2\text{B}_2\text{O}_3 \cdot \text{MgCl}_2 \cdot 14\text{H}_2\text{O}$

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**Abstract** To determine the optimal conditions for the synthesis of the solid phase  $2\text{MgO} \cdot 2\text{B}_2\text{O}_3 \cdot \text{MgCl}_2 \cdot 14\text{H}_2\text{O}$ , its crystallization kinetics from solns. containing 0.65 MgO, 1.14  $\text{B}_2\text{O}_3$ , and 24, 28, and 32%  $\text{MgCl}_2$  was studied. The experiments were carried out without stirring. At different time intervals, solution samples were taken for anal., and their d. and pH were determine until the solution d. remained basically constant Then the solid phase was separated and identified by chem. anal., IR spectra, x-ray powder diffraction, and thermal anal. The crystallization kinetic curves were all in reverse S shape. At  $<40^\circ$  the crystal growth rate increased with rising temperature, but at  $>40^\circ$  it decreased. At constant  $30^\circ$  the crystallization rate decreased with increasing  $\text{MgCl}_2$  concentration At the experimental temps. and concns., only  $2\text{MgO} \cdot 2\text{B}_2\text{O}_3 \cdot \text{MgCl}_2 \cdot 14\text{H}_2\text{O}$  crystd. from the solution An appropriate math. modification of Nielsen's mononuclear-layer and polynuclear-layer controlled-growth mechanism was made. The experimental data were fitted using a simple optimum method and a Runge-Kutta solution of a differential-equation system. The kinetic equation of the crystallization reactions is given, and a mechanism of crystallization reactions is proposed.

**Key words** [REACTION MECHANISM](#) [CAMSELLITE](#) [BORATES](#) [MAGNESIUM OXIDE](#) [HYDRATE](#) [MAGNESIUM CHLORIDE](#) [BORON OXIDE](#) [CRYSTALLIZATION KINETICS](#) [DIFFERENTIAL EQUATION](#) [KINETIC STUDY](#) [CRYSTALLIZING RATE](#)

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