Dissolution Characteristics and Electrochemical Mechanism of NaCl-NaF-KCl-SiO₂ Melt

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The dissolution characteristics of SiO₂ in a NaCl-KCl-NaF system were analyzed. The results showed an increase in the SiO₂ content in $X_{\text{NaCl}}: X_{\text{KCl}}: X_{\text{NaF}} = 1: 1: 2$, and the melt primary crystallization temperature first decreased and then increased. The temperature of primary crystallization was lowest when $X_{\text{SiO}_2} = 10\%$. The solubility of SiO₂ in the NaCl-NaF-KCl-SiO₂ melt system increases with increasing temperature. According to the thermodynamic calculations of the SiO₂-NaCl-KCl-NaF system and the XRD results, SiO₂ was dissolved in $aX_{\text{NaCl}}: X_{\text{KCl}}: X_{\text{NaF}} = 1: 1: 2$ melt solution at 800 °C. The surface of the deposited sample was analyzed by XRD. The intermetallic compounds Fe₃Si, FeSi and Fe₅Si₃ were generated from the dissolved Si.

Keywords: Melt; Primary crystallization temperature; Solubility; Electrochemistry

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