Electrochemical Behaviour of Tin in a LiCl-KCl Eutectic Melt

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The electrochemical behaviour and thermodynamic properties of SnCl₂ in a LiCl-KCl eutectic melt was investigated on graphite and Mo electrodes at 500°C by cyclic voltammetry, chronopotentiometry, square wave voltammetry, and open circuit chronopotentiometry. Two redox couples of tin ions due to Sn(IV)/Sn(II) and Sn(II)/Sn were obtained, and the cathodic peak potentials were found to be 0.50 V and -0.50 V, respectively. The reduction reactions of Sn(IV)/Sn(II) and Sn(II)/Sn are quasi-reversible processes and occur with two exchanged electrons, respectively. The diffusion coefficients of the Sn(IV) and Sn(II) ions were also determined on graphite electrode by the Berzins-Delahay equation, which were 2.68×10^{-5} cm²/s and 5.19×10^{-5} cm²/s, respectively. In addition, square wave voltammetry and open circuit chronopotentiometry experiments performed on a Mo electrode further indicated that the reduction of Sn(II) into Sn metal occurred in a single step and two electrons were exchanged. The research lays a foundation for electrolytic refining and electrodeposition of Zr-Sn alloy.

Keywords: molten chlorides, tin, diffusion coefficient, electrochemical behaviour

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