Electrochemical Studies on the Reduction Behavior of Co^{2+} in Eutectic NaF-KF Melt

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In this work, the electrochemical behavior of cobalt ion was investigated using an inert graphite rod electrode at 1073 K in NaF-KF- CoF_2 (1 wt%) molten salt system. Several transient electrochemical techniques, such as cyclic voltammetry, square wave voltammetry, and chronopotentiometry, were used. Results showed that electroreduction of Co^{2+} to Co is a reversible, one-step, two-electron transfer. The diffusion coefficient of Co^{2+} was investigated with cyclic voltammetry, square wave voltammetry, and chronopotentiometry, and results from the considered methods exhibited fair agreement. Electrodeposition of cobalt was performed at -0.3 V versus Pt at 1073 K for 4 h in a NaF-KF- CoF_2 (1 wt%) melt. The deposits were examined using X-ray diffraction and X-ray fluorescence, and results confirmed the obtained deposits as metallic cobalt. The present study aims to provide a theoretical reference for electrolysis of WC-Co hard metal scraps in molten salt.

Keywords: Cobalt, Molten salts, Electrochemistry, Diffusion coefficient.

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