Electrochemistry of Zr (IV) in molten LiCl–KCl–K₂ZrF₆ System

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The electrochemical behaviors of Zr (IV) in the molten LiCl–KCl–K₂ZrF₆ system were investigated on tungsten and copper electrodes at 993 K respectively. By electrochemical tests including cyclic voltammetry, square wave voltammetry, chronopotentiometry and open circuit chronopotentiometry. Zr (IV) was reduced to Zr (0) in two steps with two electrons transfer in each one. The diffusion coefficient of Zr (IV) was $5.01 \times 10^{-5} \text{ cm}^2/\text{s}$ examined by cyclic voltammetry in the molten salts. The electrochemical signal of Cu–Zr intermetallic compound was detected at -1.0 V(vs. Ag/AgCl). Cu₅Zr, Cu₅₁Zr₁₄ and Cu₈Zr₃ were obtained by galvanostatic electrolysis at 0.05 A for 20 h. These intermetallic compounds were characterized by X-ray diffraction analysis (XRD) and scanning electron microscopy with energy dispersive spectrum (SEM–EDS). In this work we provided an efficient way to prepare Cu–Zr intermetallic compounds.

Keywords: Zirconium, Copper, Electrochemical test, Galvanostatic electrolysis, Intermetallic compounds

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