Study on Properties of thin Tungsten Coatings Prepared in Na₂WO₄ Molten Salt

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In this paper, tungsten coatings on copper substrates were prepared by electro-deposition from a Na₂WO₄ molten salt system at 1173K. The coating composition, microstructure, and morphology were studied via XRD, SEM, EDS, and LSCM. The electrochemical reduction mechanism of W⁶⁺ in the Na₂WO₄ system was investigated by cyclic voltammetry and square wave voltammetry. The results demonstrate that the tungsten coatings obtained under different process parameters are free from impurities. At a current density of 20 mA/cm², the tungsten coating shows no apparent crystal plane orientation, and a dense tungsten coating with a preferred orientation along the (211) plane is obtained as the current density increases. As the electrodeposition duration increases, the (211) crystal plane texture coefficient increases. The tungsten reduction process in the molten salt system at 1173 K follows a two-steps reaction, W(VI)→W(IV)→W.

Keywords: Molten salt; Electrodeposition; Tungsten coatings; Electrochemical Mechanism

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