Effect of Electroplating Bath Composition on Corrosion Resistance of Deposited Cobalt Films

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Preparation and corrosion resistance of cobalt films deposited on polycrystalline platinum in different electroplating baths (chloride bath, sulfate bath and chloride-citrate bath) have been studied. Cyclic voltammetry (CV) was used to study the electrodeposition process of cobalt films. Films composition, structure and surface morphology were analyzed by X-ray diffractometer (XRD), atomic force microscope (AFM) and metallographic microscope. Furthermore, the corrosion resistance were measured by potentiodynamic polarization curve and electrochemical impedance spectroscopy (EIS). In different electroplating baths, the shape of cyclic voltammetry curves are similar, where both under-potential deposition behavior and over-potential deposition behavior are presented. The cobalt film obtained from chloride bath is thicker and rougher with acicular shape particles; in sulfate bath, the cobalt grains are spherical shape and the film is smooth with obvious cracks; in chloride-citrate bath, the cobalt grains are seemly much smaller and the film is the smoother and thinner. The component of prepared films in three electroplating baths are mainly cobalt grains with crystal plane of (111), (200) and (220). In 3.5wt.% NaCl solution, the corrosion rate order of deposited cobalt films is $v_{\text{chloride bath}} < v_{\text{sulfate bath}} < v_{\text{chloride-citrate bath}}$.

Keywords: Polycrystalline platinum, Electrodeposition, Cobalt film, Corrosion resistance

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