Mechanism of Chromium Electrodeposition from Cr(III) Baths on Nickel and Chromium Electrode Surfaces

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The electrode state changes with the thickening of the coating in Cr(III) thick chromium plating. The deposition of Cr(III) is carried out on the substrate at the beginning of deposition and on the chromium coating when the chromium coating becomes thicker. The aim of this work is to study the influence of the change of electrode state on the reduction mechanism of trivalent chromium. The electrodeposition mechanism of Cr(III) is studied by cyclic voltammetry, electrochemical impedance spectroscopy, chronoamperometry and polarization technique. The results show that the reduction of Cr(III) on chromium coating electrode has a negative deposition potential, higher charge transfer resistance, higher activation energy, and lower diffusion coefficient than those on the nickel electrode, the reduction of Cr(III) is more difficult on chromium coating electrode. The change of electrode state is one of the reasons for the difficulty in thickening of chromium coating.

Keywords: Trivalent chromium; Hard chromium electrodeposition mechanism; Nickel electrode; Chromium coating electrode;

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