Effect of Methoxypolyethylene Glycol on Trivalent Chromium Electrodeposition

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The effect of methoxypolyethylene glycol (mPEG) on chromium electrodeposition from a mixture of 1-butyl-3-methylimidazolium-bromide ([BMIM]Br) ionic liquid and water is studied. The addition of mPEG does not affect the two-step reduction process of Cr(III). With the presence of mPEG in the electrolyte, the diffusion coefficient decreases dramatically, and the resistance of the electrolyte and charge transfer increase, resulting in a reduced deposition rate and a smooth and crack-free coating surface. The hydrogen evolution reaction is suppressed, and more metallic Cr is deposited in the coating layer. Considering both the surface morphology and corrosion resistance, 80 mmol L⁻¹ mPEG is the optimum concentration for smooth and pinhole-free chromium electrodeposition in the mixture of [BMIM]Br ionic liquid and water.

Keywords: Trivalent chromium, Electrodeposition, 1-Butyl-3-methylimidazolium-bromide ionic liquid, Methoxypolyethylene glycol

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