Effect of Bis-3-Sulfopropyl-Disulfide on the Characteristics of Trivalent Chromium Electrodeposition

Sol-Ji Song¹, Sang Jin Ko¹, Jae-Ryung Lee², Jung-Gu Kim^{1,*}

¹ School of Advanced Materials Science and Engineering, Sungkyunkwan University, 300 Chunchun-Dong, Jangan-Gu, Suwon 440-746, Republic of Korea

² Research and Development Laboratory, POSCO, 6261, Donghaean-ro, Nam-gu, Pohang 37859, Republic of Korea

*E-mail: kimjg@skku.edu

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This study examined the effect of bis-3-sulfopropyl-disulfide (SPS) addition to chromium sulfate solution on the characteristics of trivalent chromium electrodeposition. To investigate the effect of SPS on current efficiency, electrodeposition was carried out on the Invar surface at a constant current over time. Electrochemical tests, surface and solution analyses, density functional theory calculation, and Vickers micro-hardness tests were conducted to identify the SPS mechanism and evaluate its properties. SPS addition improved the electrodeposition current efficiency more than two-fold by increasing the nucleation of the electrode and changing the Cr-complex in solution to increase the bonding length between trivalent chromium ions and water molecules. Also, the surface hardness and corrosion resistance of the electrodeposited specimen were improved in the SPS-containing solution.

Keywords: Trivalent chromium; Electrodeposition; Bis-3-sulfopropyl-disulfide; Current efficiency

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