

Effect of Plating Parameter on Current Efficiency in Trichromium with Oxalate as Complex

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Abstract

Hexavalent Chromium plating process needs to be substituted by more environmental friendly technologies due to the intense toxicity and carcinogenicity of Cr (VI). In this paper, the decorative chromium plating prepared from trivalent chromium (trichrome) plating bath which contains oxalate as complex agent is studied to alternate the conventional ones from hexavalent chromium (hexachrome). The effects of plating parameters such as current density, bath pH and plating time on current efficiency were investigated. A appropriated plating bath was chosen for decorative trivalent chromium plating with the following compositions: 140 g/L $Cr_2(SO_4)_3 \cdot 6 H_2O$, 30 g/l $Na_2C_2O_4$, 110 g/L $Al_2(SO_4)_3 \cdot 18H_2O$, 80 g/L Na_2SO_4 , 15 g/L NaF . The efficiency was achieved from 11.38 % to 25 %. Current efficiency (CE) of trivalent chromium plating increases along with current density (for example, at t = 2 minutes; pH= 1.5, CE = 13.22 at i = 20 A/dm², CE = 17.9 at i = 25 A/dm², CE = 19.56 at i = 30 A/dm²). CE of trivalent chromium plating decrease with plating time (at pH=1.9, i= 30A/dm², CE = 25 when t= 2 minutes, CE 17,5 when t=15 minutes). The highest current efficiency achieved at pH= 1.9, t = 2 minutes, i = 30 A/dm² (25%). However, the trend of influence of pH on current efficiency was not clear.