Role of Activators in Bright Chrome Electroplating

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Role of activators such as sodium silicofluoride and sulfuric acid in bright chrome electroplating was investigated using technical grade chromic acid, CrO_3, containing 0.15% sulfate, maximum. Experiments carried out were: a- chrome deposition on brass panels in Hull cell using Na_2SiF_6, 1-8 g/L, concentrated H_2SO_4, 1-2 m/L, and CrO_3, 150-500 g/L, within temperatures, 15-50^oC and at current densities, 6-15 A/dm^2, b- chrome plating on nickel plated mild steel panels; nickel was first deposited from Watts nickel bath to nickel thickness 15~25 μm. Hull cell experiments were carried out to observe the effect of temperature, current density, CrO_3 concentration, sodium silicofluoride concentration.

It was found that: a- improved throwing power was achieved with enhanced concentrations of CrO_3, with leveling observed at higher chromic acid concentrations, the current efficiency is known to be [1] a function of higher concentration of chromic acid, figure 1, b- best results in terms of throwing power were obtained at sodium silicofluoride concentration 2-3 g/L. Sodium silicofluoride concentration higher than 3 g/L gave poor throwing power; results obtained using sodium silicofluoride were comparable to those using proprietary formulation V-0663, figure 2, c- in the temperature range 25-35^oC, throwing power was consistently good for bright chrome plating, d- throwing power increased with increase in current density, figure 3.

Sulfate is an effective catalyst for the deposition of bright chromium; a brown passive film was obtained at cathode from pure chromic acid bath. It was found that bath comprising CrO_3 300-350 g/L, Na_2SiF_6 2-3 g/L, H_2SO_4 1-2 ml/L at temperature 30-35^oC and current density 8-10 A/dm^2 can be recommended as a self-regulating one for bright chrome plating. The throwing power of bath was good. Adhesion and appearance of the obtained chrome coating on nickel plated mild steel panels were good.

eReference

1- “Modern Electroplating”, M. Schlesinger and M. Paunovic, 4th ed., Wiley, New York, 2000

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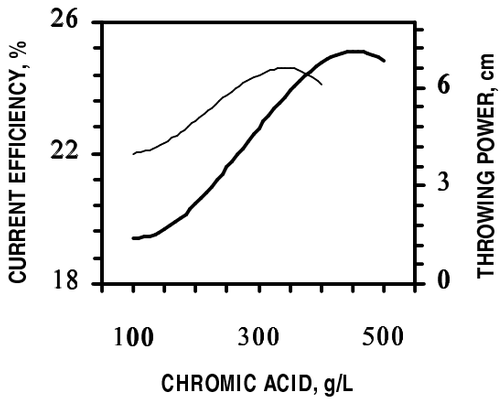

Figure 1: Influence of chromic acid concentration on throwing power and current efficiency

Current efficiency

Throwing power

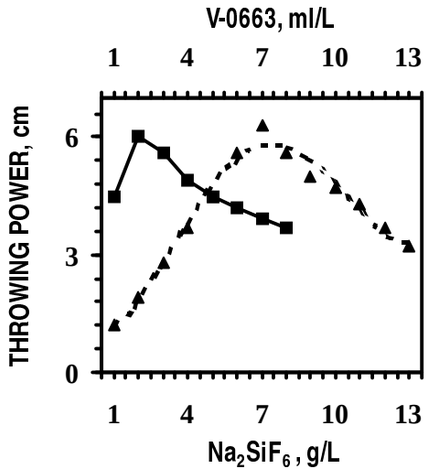

Figure 2: Influence of sodium silicofluoride, g/L, and V-0663, ml/L, concentrations on throwing power

V-0663

Sodium silicofluoride

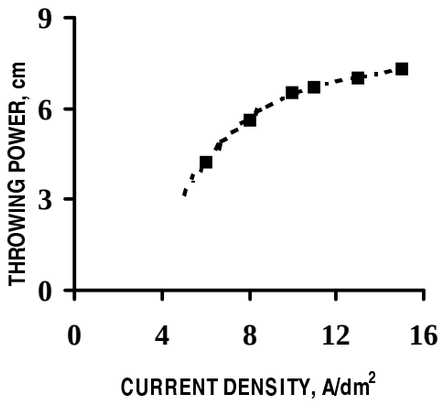

Figure 3: Influence of current density on throwing power