Effect of Sodium Bromide on the Electrodeposition of Sn, Cu, Ag and Ni from a Deep Eutectic Solvent-Based Ionic Liquid

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A number of studies into the influence of additives on the electrodeposition of metals from aqueous solution have been reported in the literature. However, very few have studied the influence of additives on metal electrodeposition in Deep Eutectic Solvents (DESs). This work will show, for the first time, the effect of sodium bromide on the electrodeposition of tin, copper, silver and nickel from a deep eutectic solvent (DES)-based ionic liquid consisting of a stoichiometric 1:2 mix of choline chloride and ethylene glycol (*Ethaline 200*). It is shown that in the presence of sodium bromide, bright and smooth Cu and Ni deposits were formed. Cyclic voltammetry and chronocoulometry have been used to examine the electrochemical properties of the plating liquids in both the absence and presence of sodium bromide. It was found that the redox peak currents of the Sn and Ag electrolytes get smaller when sodium bromide is added to the electrolyte solution. The resultant surface morphologies, topography and roughness of Sn, Cu, Ag and Ni were investigated by scanning electron microscopy (SEM/ EDXS) and 3D optical microscopy (3D). The current efficiency of metal deposits was found to increase when the deposition was achieved from an electrolyte that contained sodium bromide.

Keywords: Electrodeposition, tin, copper, silver, nickel, deep eutectic solvent, sodium bromide

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