Ethylene glycol electrolyte for electrochemical deposition of Au–Sn alloy

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Au–Sn alloy coatings containing about 30 at. % of tin are of great interest in jewellery and electronics for their mechanical properties, corrosion stability, color, solderability and the reduced cost in comparison with the pure gold. In this work new ethylene glycol (EG) electrolyte containing tin(IV) chloride and gold(III) cyanide complex has been proposed for electrochemical deposition of uniform, qualitative gold–tin alloy coatings. It was revealed that depending on the Au(III) : Sn(IV) mole ratio, concentration of gold and tin salts and current density the alloys including $AuSn_2$, AuSn or Au_5Sn intermetallic compounds at tin content of 27–54 at.% could be deposited from this electrolyte. The most solderable alloy containing crystalline phases of Au_5Sn and AuSn was deposited at Sn(IV) : Au(III) ratio of 28 : 1 at a current density equal to 15–21 $mA \cdot cm^{-2}$ and a rate of 1.3–1.9 $\mu m \cdot h^{-1}$. Cyclic voltammograms were recorded to study electrochemical behavior of gold and copper electrodes in the EG electrolyte.