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Electrodeposition of antibacterial Zn-Cu/silver nanoparticle (AgNP) composite coatings from an alkaline solution containing glycine and AgNPs.

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Abstract

The influence of the silver nanoparticle (AgNP) concentration in solution on the electrodeposition of Zn-Cu/AgNP composite coatings was studied by cyclic voltammetry. The composition and structure of the Zn-Cu/AgNP composite coatings were analyzed using glow discharge spectroscopy (GDS), inductively coupled plasma spectrophotometry (ICP), and X-ray diffraction (XRD). The electrodeposition of Zn-Cu/AgNP composites was studied in an electrolytic bath containing glycine and AgNPs in suspension and was shown to occur through two processes with different energies. The first process (Pc´) occurs in the potential range from -0.4 to -0.7 V *vs* saturated calomel electrode (SCE) and is mainly associated with the electrodeposition of a copper film, while the second process (Pc^{IV}) corresponds to the bulk deposition of Zn-Cu/AgNPs and occurs from -1.4 to -1.6 V *vs* SCE. The formation of different phases of the Zn-Cu alloys and a change in the elemental composition of the coating as a function of the AgNP concentration in solution were observed from the elemental composition analysis.

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