

Reduction of Silver Ions with Polyhydroxy Alcohols

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Reduction of silver ions from AgNO_3 and $[\text{Ag}(\text{NH}_3)_2]\text{OH}$ solutions as well as from Ag_2O suspensions with polyhydroxy alcohols, i.e., ethylene glycol, propylene glycol and glycerol was investigated. Reduction of silver ions from AgNO_3 solutions to silver metal with propylene glycol or glycerol at room temperature was very slow. Deposition of thin silver films on the activated plastic surfaces, or powders in the bulk solutions occurred at temperatures above 50 °C. Ethylene glycol, propylene glycol, and glycerol can be used more successfully for the reduction of Ag_2O suspensions to Ag powder or $[\text{Ag}(\text{NH}_3)_2]\text{OH}$ solutions to thin silver films or Ag powder. The rate of silver reduction depends on temperature, pH, and silver ion concentration. Surface morphology and structure of silver films or silver powders were determined using scanning electron microscopy (SEM) and x-ray diffraction (XRD) methods. Antimicrobial properties of reduced silver films were also evaluated.