

Nano to Nano: Electrodeposition of ZnO Nanoparticles Using Scanning Electrochemical Microscopy

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A “nano to nano” electrodeposition approach is very fascinating for preparing nano-structured thin films from the dispersion of nano-objects without altering morphologies. Typically, this approach is based on altering the ionic strength at the vicinity of the electrode surface by applying a potential. Moreover, localized electrodeposition of anisotropic metal nano objects has been successfully accomplished using scanning electrochemical microscopy (SECM), where metal nanoparticles are generated from the corresponding metal microelectrodes. ZnO nanoparticles (~ 50 nm) were locally electrodeposited onto transparent ITO conductive glass from an aqueous dispersion of ZnO in HCl at pH 6.5 without adding any polymers or surfactants. Chronoamperometry technique was employed to oxidize Au microelectrode (25 μm) to generate AuCl_4^- ions, which subsequently bound to ZnO nanoparticles and reduced on the conductive surface. Deposition time varied from 5 s to 10 s at different applied potentials from +0.92 V to +0.97 V with respect to a Ag/AgCl reference electrode. The amount of Au present in the ZnO was controlled by controlling the deposition time and applied potential to the electrode and substrate. Electrodeposited Au/ ZnO nanoparticles were characterized by SEM and XPS techniques. This localized ‘nano to nano’ approach exhibited the potential of the ZnO/Au system.

Keywords: ZnO/Au nano particles, SECM, chronoamperometry, electrodeposition