

ABSTRACT

This thesis deals with the synthesis and characterization of thin silver films on a silicon substrate. The deposition of the thin films is completed through a novel and innovative process of creating nanoparticles, more precisely the Nanogen source of the hybrid deposition system that was recently installed at the Research Unit for Nanostructured Material Systems of Cyprus University of Technology. The Nanogen source is a traditional sputtering system equipped with a condensation zone for growing nanoparticles of various diameters. In addition the system is equipped with a mass filter that controls the nanoparticles that leave the production chamber and accelerate towards the deposition substrate. Silver nanoparticles with various kinetic energies have been deposited within the activities of this thesis. The films were subsequently characterized for the optical, physical, morphological, mechanical and hydrophobic properties. The techniques of atomic force microscopy, scan electron microscopy, x-ray reflection, nanoindentation, contact angle, and uv-vis spectrophotometry have been utilized in this study. The films that were successfully deposited had nanometer roughness that changes with kinetic energy. In parallel the films exhibited high reflectivity, good mechanical properties, and hydrophobic response which can be attributed to the nanoscale topography. Due to the fact that the nanoparticles' technology field and thin films' field has developed the general sciences field immensely, the experimental process addressed in this thesis is of high interest for the creation of new and different nanotechnologies based on novel nanostructured materials.

The works of this thesis have been executed in the Nano/Micro Mechanics of Materials Laboratory and the Research Unit for Nanostructured Materials Systems

Keywords: silver nanoparticles, hydrophobicity, nanoindentation, atomic force microscopy, scan electron microscopy.