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Optical and structural characterization of gold island films on glass substrates

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Abstract

The films consisting of gold nanoparticles, prepared by electron beam evaporation on glass substrates, exhibit interesting optical properties due to localized surface plasmon resonance. The tailoring of optical properties has been achieved by varying deposition mass thickness and substrate temperature. The relation between optical and structural properties has been studied. Optical characterization of samples has been carried out by variable angle spectroscopic ellipsometry and for structural characterization grazing incidence small angle X-ray scattering and atomic force microscopy have been used. Results show how the structural properties, obtained by using specific fabrication parameters, influence the resulting optical characteristics. The differences in concentration, shape and size of the produced gold nanoparticles result in a spectral shift of localized surface plasmon resonance, and a change of its width and intensity. The appearance of percolation is signed by Drude-like infrared absorption.

Keywords: gold nanoparticles, metal islands, localized surface plasmons, spectroscopic ellipsometry, GISAXS, optical properties, structural properties

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