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Plasmon resonance absorption of Ag nanoparticles deposited at different fluence by PLD

Silver nanoparticles were deposited on glass substrates by means of PLD. Two fluence values were used for the experiments, 2.5 and 8.3 J/cm2. Four films were grown for each fluence changing the number of pulses (300, 600, 900 and 1200 pulses). The laser produced plasmas were diagnosed by means of Langmuir probe measurements, from which time of flight curves (TOF) were obtained. Mean kinetic ion energy and density were calculated form TOF curves. The ion density was fixed at 6 x1013 cm-3 while the mean kinetic ion energy changed from 162 eV for 2.5 J/cm2 to 254 eV for 8.3 J/cm2.

The nanostructured thin films were optically characterized by UV-Vis spectroscopy, from which the well known signal of surface plasmon resonance absorption near 400 nm was observed for all the samples. The analysis of the absorption band, revealed that signals corresponding to samples grown at 8.3 J/cm2 are narrower than those of the samples grown at 2.5 J/cm2, indicating a lower size dispersion when using higher fluence, however the absorption maximum is much higher for samples grown with low fluence, which is related to particle density, which means that lower fluence allows deposition of a higher number of nanoparticles. On the other hand, the peak position shifts to higher wavelengths as fluence decreased, which indicates that nanoparticles deposited with higher fluence are smaller. Regarding number of pulses, for both fluence values, an increase of the absorbance maximum with the number of pulses was observed, revealing the increase of nanoparticles density deposited in the glass substrates. Finally, representative samples were measured by AFM, which corroborated the results from UV-Vis.

Keywords

Pulsed Laser Deposition, Ag nanoparticles, Fluence, surface plasmon resonance absorption

Reference

Does not apply

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I confirm

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