

REFLECTOMETRY STUDY OF NANOPOROUS FILMS WITH ARRAYS OF GOLD NANOPARTICLES

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S u m m a r y

The influence of conditions occurring at the pulsed laser deposition of films with gold nanoparticles on the film porosity has been studied, by using the X-ray reflectometry. The films of two types were obtained by depositing particles (i) from the direct high-energy flow of erosion-torch particles and (ii) from the backward low-energy one. In both cases, the films were deposited either at the residual air pressure $p = 10^{-2}$ Pa or in the argon atmosphere with the pressures $p_{Ar} = 5\text{--}100$ Pa. In case (i), the film porosity was 0.1% at $p = 10^{-2}$ Pa and 1% at $p_{Ar} \leq 5$ Pa. The plasmon properties of those films are associated with the propagation of surface plasmon-polariton waves. As the argon pressure grew further up to 100 Pa, the porosity increased to approximately 30%. In case (ii), the porosity of films deposited at $p_{Ar} = 5\text{--}100$ Pa onto substrates located in the target plane equaled 30 to 70% and depended on the distance from the film to the torch axis. All films with the porosity higher than 20% turned out nanocomposite structures with arrays of gold nanoparticles, which enabled us to observe the excitation of local surface plasmons.