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Specificity of silver nanoparticle synthesis in quartz glass upon low-energy ion implantation

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Abstract

Silica-based composite materials with silver nanoparticles (NPs) were studied. Synthesis of the NPs was carried out using a low-energy (30 keV) implantation of Ag⁺ ions to high fluences. After the implantation, the samples were thermally annealed at 300°C for 1 hour in argon atmosphere. Synthesized NPs demonstrated an absorption band related to surface plasmon resonance (SPR). Shift of the SPR maximum towards longer wavelengths was found with an increase of ion fluence. This shift correlates with an enlargement of the hemispherical protrusions observed on the sample surface using atomic force microscopy. The obtained results were interpreted as increase of the NPs in size. It was shown that the post-implantation thermal annealing leads to change of size of the NPs thus allowing to develop a technological approach for controlled synthesis of NPs in shallow dielectric layers. © 2011 Pleiades Publishing, Ltd.

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