

## Nanocomposites and nanomaterials

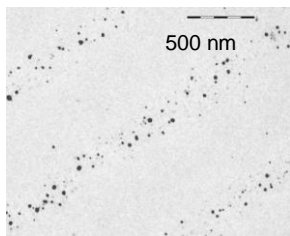
### Periodic polymer–silver nanoparticles structures obtained due to reduction of silver nanoparticles from the precursor spatially distributed by holographic exposure

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New approach to produce volume periodic structures of polymer/metal nanoparticles is presented. The distribution of Ag nanoparticles in polymer film can be obtained using holographic pattern in UV or vis spectral range to the composite material comprises a mixture of photocurable monomers, photoinitiator and a solution of a silver nitrate in acetonitrile. Photopolymerisation of the composite in the interference pattern provide a formation of high-efficient volume grating consisted from the periodicity of polymer and metal precursor-containing regions. A subsequent homogeneous UV irradiation or/and thermo-treatment of the grating cause the reduction of silver salt to Ag nanoparticles selectively in the areas of the film containing metal precursor. Spectroscopic measurements are reported to confirm the formation of the Ag nanoparticles in the gratings. Transmission electron microscopy showed a regular distribution of well-defined Ag



TEM image of the grating.

nanoparticles in polymer film with a periodicity governed by the geometry of the holographic structuring. Average diameter of nanoparticles can be controlled by wavelength and intensity of the holographic exposure as well as the composite formulation. Possible mechanism for the formation of silver nanoparticles is presented. The products of photolysis of the photoinitiating systems used have been assuming as a reducing agents of silver.

Using the same technique 2D and 3D distributions of silver nanoparticles in polymer can be obtained applying the exposure to the interference pattern formed by 3 or 4 laser beams. The method presented are suitable to produce such periodic microstructures for using in optical memory, integrative micro-optical switches, optical and photonic devices based of nonlinear optical effect, etc.

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