Nanocomposites and nanomaterials

Formation of 2D structures by holographic method and their application.

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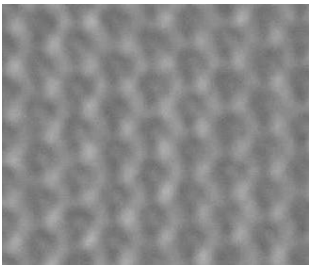
2D photonic crystals with different symmetry on photopolymer materials were created using modified, low cast, versatile holographic lithography method. One-exposition recording in interference field created by three or four laser beams was used. The maximum contrast of structure, which can be supported by dynamic range of material, was achieved.

2D structures polymer – nanoparticles (NP) were obtained by *in situ* synthesis of metal NP from metal precursor spatially distributed in polymer matrix previously. It was shown that using spatial light modulator for change of phase shift between beams provides gradual change of intensity distribution in the recording field and allows creating structures with simple symmetry, but with different distribution of polymer and NP.



Fabricated photonic crystals (example in figure) are characterized by high temporal stability of parameters (at least 5 years) and are potentially usable for the photonic crystal devices. DFB lasers based on 2D structures are simple for fabrication and have excellent characteristics: low lasing threshold (5 $\mu J/cm^2$), narrow-band lasing (line-width $\leq 0{,}2$ nm), and low divergence. The shape and width of the lasing lines remain constant even at pump energy 5-fold higher than the corresponding threshold ones.

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