Optically active plasmonic glass composites fabricated by crystal growth techniques

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Optically active volumetric glass materials obtained with micro-pulling down method are presented. Nanocomposites with plasmonic properties are fabricated by Nanoparticle Direct Doping (NPDD) method. Introduction of various dopants into the volume of the material allows us to observe optical effects in the glass composites.
New generation of plasmonic materials are manufactured by NPDD method developed in our laboratory. Possibility of addition of nanoparticles (NPs) lets us easily dope glasses with NPs of various electromagnetic properties, thus tuning LSPR to enhance the targeted effects, e.g. photoluminescence of quantum dots, induction of Purcell effect: shortening of PL lifetime, or anisotropic effect in case of glass composites with non-spherical NPs. Theoretical calculations elucidate the plasmonic origin of the observed improvement of emission parameters, confirming that it results from multiscale light enhancement in nanocavities between at least two metallic nanoparticles.
Combining research on both fabrication and characterization of the novel materials with unusual electromagnetic properties is a step towards the development of low-cost high-performance photonic devices with enhanced functionalities.

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