

## LASER-ASSISTED PRECIPITATION OF METAL AND SEMICONDUCTOR NANOPARTICLES IN OXIDE GLASS

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**F**emtosecond laser processing of oxide glasses is a perspective way for the development of novel glass-based optical materials. Oxide glasses doped with metal or semiconductor nanoparticles are expected to be especially promising because their unique properties depending on nanoparticle size may be combined with their micromodification by ultrafast laser beam fabricating various 3D structures with controlled optical properties. Laser-irradiated areas of predetermined geometry containing metal or semiconductor nanoparticles in a single piece of glass pave the way to improve a lot of photonic devices, such as ultrafast optical switches, polarization converters, active channel waveguides and high-density optical memory. Here, we report about one-step space-selective precipitation of silver or cadmium sulphide nanoparticles by femtosecond laser pulses inside silicate and phosphate glasses. We demonstrate that femtosecond laser irradiation of such glasses induces ring-shaped coloured microdomains which are prone to luminescence, absorption and homogeneous birefringence. Structure, chemical composition and sizes of nanoparticles formed in laser-written domains were examined by Raman spectroscopy, transmission electron microscopy and energy-dispersive X-ray spectroscopy. Variation of dopant concentration and laser writing conditions (i.e. pulse repetition rate, number of pulses, pulse duration and energy) are established to provide an opportunity to control optical and luminescent properties of the laser-induced domains. Scenario of femtosecond laser-induced precipitation of silver and cadmium sulphide nanoparticles inside oxide glasses was proposed.

### Biography

Maxim P Vetchinnikov is a postgraduate student at the Department of Glass and Glass-ceramics of Mendeleev University of Chemical Technology of Russia. Since 2014, he is an Engineer of the International Center of Laser Technology and P Sarkisov International Laboratory of functional glass-based materials. His field of scientific interests and the scope of his current PhD study are Investigation of Metal- and Semiconductor-Doped Glasses and Space-Selective Laser-Induced precipitation of Plasmonic Nanoparticles and Quantum Dots in glasses. Results of his research have been published in 4 papers in peer-reviewed journals and protected by one patent of Russia.

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