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Optical Properties of Lead Borate Glasses Containing Ag Nanoparticles P.K. BABU, AKINLOLUWA OLUMOROTI, SAISUDHA MALLUR, Western Illinois University — We prepared a series of lead borate glasses containing Ag nanoparticles. Ag nanoparticles were derived from silver nitrate that was added as a precursor during glass preparation. Thermochemical reduction of silver nitrate to silver atom was achieved by controlled annealing near the glass transition temperature. Transmission electron microscope (TEM) images confirm the formation of Ag nanoparticles and the variation of their sizes with the duration of annealing. Optical absorption experiments show that a well-defined surface plasmon resonance (SPR) peak can be observed only for samples that were annealed for 36 hrs. We also investigated the effect of Ag nanoparticles on the fluorescence of Pb^{2+} ions. The excitation spectra obtained at two different emission wavelengths clearly show that Ag nanoparticles create new Pb^{2+} emission centers by altering the chemical environment of lead ions. Comparing our results with earlier investigations on Pb^{2+} fluorescence reveals that the new emission centers represent lead dimers and lead aggregates. Detailed analysis of the emission spectra show that in lead borate glasses containing Ag nanoparticles, the fraction of lead aggregates increases systematically with heat treatment.

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