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Nanocrystalline Composite Media in the GeO_2-Ga_2O_3 Mullite-Type System: Synthesis and Conventional as Well as Synchrotron Based Characterization KRISTINA E. LIPINSKA-KALITA, Dept. of Chemistry, University of Nevada Las Vegas, NV, USA, PATRICIA E. KALITA, Dept. of Physics, University of Nevada Las Vegas, NV, USA, OLIVER HEMMERS, Dept. of Chemistry, University of Nevada Las Vegas, NV, USA, CEDRIC L. GOBIN, Dept. of Physics, University of Nevada Las Vegas, NV, USA, GINO MARIOTTO, University of Trento, Dept. of Physics, Trento, Italy, THOMAS HARTMANN, LONGZHOU MA, Harry Reid Center for Environ. Studies, University of Nevada Las Vegas, NV, USA — In the frame of our extensive project on nanocomposites based on dielectric matrices, we designed and synthesized a series of optically transparent glass-based composites, containing nanometer-sized crystals embedded in an isotropic host matrix. We determined the structure of the nanocrystals to be an orthorhombic GeO_2-Ga_2O_3 mullite-type phase, isostructural with SiO_2-Al_2O_3 mullite. In order to characterize the materials synchrotron X-ray diffraction, optical spectroscopy and electron microscopy were used. High-pressure compression and decompression studies up to 40 GPa were also performed to investigate the structural integrity of the nanocrystals. This work is the first report of a controlled, successful synthesis of Ge-Ga mullite type nanocrystalline composites.

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