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Heterogeneities in the silver oxide-lead-germanate glasses

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Abstract

The present investigation explores the adaptability of the lead-germanate network with the Ag_2O content in the system with $xAg_2O\cdot(100\text{-}x)[7GeO_2\cdot 3PbO_2]$ composition where x=0-40mol% Ag_2O. All obtained glasses have amorphous structure. The existence of crystallite particles with different morphologies in studied glasses was confirmed by the Scanning Electron Microscopic (SEM) and the Small Angle Neutron Scattering (SANS) investigations.

Our IR and Raman data show that by increasing the Ag_2O content of samples up to 15mol%, the $[GeO_4]$ tetrahedral structural units were converted in $[GeO_6]$ octahedral structural units and an increase in the polymerization visibly of the glass network was observed. In this manner the excess oxygen atoms added to the host matrix through modifier oxides are taken up by transforming of lead-germanate network to silver-lead-germanate glassy network. Some silver atoms will be implied in the compensation of the excess of negative electric charge and another are taken up by forming of Ag-O bonds.

The analysis of quantum chemical calculations on the local structure of the $40Ag_2O\cdot 60[7GeO_2\cdot 3PbO_2]$ network suggest the presence of deformed higher-fold