Poster Presentations
Wednesday, Sept. 22

0201 | The nucleation of silver nanoparticles In Tm^{3+} doped germanate glasses

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Due to the possibility of modifying the optical properties of glasses, heavy-metal oxide glasses containing metallic nanoparticles (NPs) have been largely investigated in the last years. In this work, we present the influence of silver NPs nucleation in PbO-GeO_2 glasses. These glasses have already proved to be adequate host for the NPs nucleation [1-4]. The influence of the heat-treatment time on the nucleation of silver NPs in Tm^{3+} doped PbO-GeO_2 glasses was investigated. The melting-quenching technique was used and two different ways for the heat-treating were adopted for the reduction of Ag^+ and nucleation of silver NPs; the differences on the nucleation were observed using the transmission electron microscopy (TEM) images. We also report the influence of the NPs in the infrared-to-visible frequency upconversion (UPC) luminescence of Tm^{3+} ions. The emission spectra were performed by exciting the samples with a cw 1050 nm ytterbium laser and observing the UPC in the blue-red region. The enhanced UPC emission is attributed to the local field effect in the proximity of NPs.

1. Gómez et al., Appl. Phys. Lett. 92, 141916 (2008).
2. da Silva et al., Appl. Phys. Lett. 90, 081913 (2007).
3. Jiménez et al., J. Appl. Phys. 104, 054313 (2008).
4. Kassab et al., Appl Phys. Lett. 94, 101912 (2009).

Keywords: heavy metal oxide glasses, silver nanoparticles, upconversion of Tm^{3+}.

0203 | Microscopic relationship among properties of potassium germanate glasses

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Germanate glasses are applied to glass fibers or optronics. However, they have not been studied intensively so far. Therefore we investigated potassium germanate glasses. We prepared potassium germanate glasses $xK_2O{\cdot}(100\text{-}x)GeO_2$ (x indicates K_2O mol%) in the composition range of $0 \leq x \leq 52$ by the solution method.

Potassium germanate glasses show "germanate anomaly" i.e. adding potassium oxide to germania glass, the physical property of potassium germanate glasses shows a maximum or minimum in their composition dependences. We have studied potassium germanate glasses by Raman scattering, Brillouin scattering and differential scanning calorimetry (DSC). Raman spectra, sound velocity and glass transition temperature are investigated by Raman scattering, Brillouin scattering and DSC respectively.

First, we have studied the K_2O composition dependence of Raman spectra, we find that K_2O composition of the density maximum is approximately 10 mol% using the curve fitting method. Second, sound velocity and elastic moduli are investigated by Brillouin scattering measurement. The K_2O composition that their maximum occurs is approximately 15 mol%. Third, the K_2O composition dependence of glass transition temperatures is measured by DSC. The K_2O composition of the maximum of glass transition temperatures is approximately 19 mol%.

In the presentation, we will discuss the origins of these anomalies on the basis of the glass structures.

Keywords: germanate anomaly, potassium germanate glasses, solution method, glass transition temperature, curve fitting method.

0205 | Fabrication of $LiMn_xFe_{1-x}PO_4$ crystals via the glass–ceramic route and their lithium ion battery performance

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The olivine-type $LiMn_xFe_{1-x}PO_4$ crystals are fabricated through the crystallization of Li_2O–MnO_2–Fe_2O_3–P_2O_5 glasses, and the lithium ion battery performance (electrochemical charge/discharge patterns) for the glass–ceramics with $LiMn_xFe_{1-x}PO_4$ crystals is examined. It is found that homogeneous glasses are obtained for the stoichiometric compositions corresponding to $LiMn_xFe_{1-x}PO_4$ with $0 < x < 0.8$ in a conventional melt-quenching method in air. The heat treatment of the mixtures of glass powders and glucose (5 wt%) at crystallization temperatures in a reducing atmosphere of 7%H_2–93%Ar gives the for-