

Influence of Sm^{3+} ions on the structural and thermal properties of the $\text{TeO}_2\text{-Li}_2\text{O-ZnO}$ vitreous system.

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Glasses containing TeO_2 as a network former are considered good hosts for rare-earth ions. This fact can be attributed to the characteristics of the Te-O bonds that can be broken by heavy metals or rare-earth ions. TeO_2 has a three-dimensional TeO_4 trigonal bipyramidal network, once the modifier is introduced into the structure, conversion of TeO_4 units into TeO_{3+1} and TeO_3 units will occur. The present work aims to investigate the influence of Sm^{3+} ion on the structural and thermal properties of the TLZ glassy system. The samples were characterized by X-ray diffraction, Differential scanning calorimetry, physical properties, Raman and Fourier transform infrared Spectroscopy. The XRD results confirmed the amorphous characteristic of samples. The results showed that the addition of Sm^{3+} ions increase the density values indicating increased connectivity of the glass network. The oxygen packing density values decrease and tend to remain constant, i.e., the NBO tend to organize themselves in the structure. The DSC results showed that Sm^{3+} ions do not influence the thermal properties of the glass. The non-doped TLZ showed a T_g of 265°C and adding 0.5 mol% to its composition increased to 267°C. The Raman and FTIR results indicate an increase in the region attributed to the vibration of TeO_4 units without NBO. This same behavior is observed for the region assigned to TeO_4 units with NBO, we observed an increase as Sm^{3+} is added. The region of structural units of TeO_3 , had a significant increase with the addition of Sm^{3+} . However, the band attributed to the TeO_{3+1} units with NBO remained constant with the incorporation of Sm^{3+} . Finally, the addition of Sm^{3+} in the TLZ system is advantageous as it does not change the thermal properties of these glasses, indicating that the structural change is due to the organization of the NBOs. This stability shows that TLZ glasses can be doped effectively for many photonic applications.

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