Structural properties of tellurite glasses

A. Santic[1]*, A. Mogus-Milankovic[1], C. S. Ray[2] and D. E. Day[2]
[1]*Rudjer Boskovic Institute, Department of Physics, 10000 Zagreb, Croatia*
[2]*University of Missouri-Rolla, Graduate Center for Materials Research, Rolla, MO 65409, USA*

The structure of α-TeO_2 polycrystalline material, TeO_2 glass and crystallized beads, and xNa_2O-(100-x)TeO_2 ($0 \le x \le 33.3$) glasses have been investigated by XRD and Raman spectroscopy. In the TeO_2 glass beads deformed TeO_4 tbp are connected by sharing corners similarly as in α-TeO_2 polycrystalline material. The Raman spectra exhibit that the structure of the xNa_2O-(100-x)TeO_2 ($0 \le x \le 33.3$) glasses is composed of both TeO_4 tbp and TeO_3 tp while the fraction of TeO_3 tp increases with increasing Na_2O content. The changes in the glass structure with increasing Na_2O content are a result of Te—O—Te disruption and the formation of non-bridging oxygens (NBO). The XRD and Raman spectra for the xNa_2O-(100-x)TeO_2 ($0 \le x \le 33.3$) crystallized compositions show that the composition containing 16.7, 20.0 and 25.0 mol% Na_2O crystallized to α-TeO_2 and $Na_2Te_4O_9$ crystalline phases. Comparing the Raman spectra of glasses and crystallized compositions containing > 20 mol% Na_2O it was shown that the local structure of glasses differs from the structure of their crystalline counterparts.