

Graphene oxide deposition on neodymium doped zinc borotellurite glass surface: Optical and polarizability study for future fiber optics

ABSTRACT

Neodymium oxide doped tellurite-based glass has been widely documented for potential uses in optoelectronics, but graphene oxide (GO)-coated tellurite-based glass has rarely been reported. In this work, we compare two sets of glass series which were GO-coated and uncoated tellurite-based glass series denoted as ZBTNd-GO and ZBTNd, respectively. The two sets of glasses were fabricated via melt-quenched process. A set of glass was coated with GO using low-cost spray coating method. The structural and morphological properties of the glass samples were investigated to confirm the type of structure in glass and formation of graphene oxide on glass surface. The X-ray diffraction (XRD) pattern confirmed the amorphous structural arrangement in both sets of glass series. The morphological study proved the existence of GO layers on top of the ZBTNd-GO surface. The optical bandgap energy of ZBTNd-GO glass was found in the range of 3.253 eV–3.381 eV which was higher than ZBTNd glass. Meanwhile, the refractive index of ZBTNd-GO glass varies from 2.301 to 2.332 which was higher than ZBTNd glass due to the presence of functionalized oxygenated groups in GO structure. The oxide ion polarizability of ZBTNd-GO glass was found decreased due to the shift of optical band gap when coated with GO. This work offers a new form of glass that could be used as a new strategy to upgrade the current photonic materials.

Keyword: Optical bandgap; Refractive index; Oxide ion polarizability