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Optical properties and crystallization kinetic of tellurite glass-ceramics

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Quaternary tellurite glass systems in the form $((75-x) \text{TeO}_2 - 20\text{ZnO} - 5\text{Na}_2\text{CO}_3 - x\text{Er}_2\text{O}_3)$ glass samples with $0 \leq x \leq 2.5$ mol %) have been prepared by the melt quenching technique. Density, molar volume and oxygen packing density of every glass composition have been measured and calculated. Differential Scanning Calorimetry (DSC) have been carried out on the prepared glass systems in the temperature range 300-800°C at heating rate 10, 15, 20°C/min. The glass transition T_g and crystallization T_c temperatures values were measured from DSC. Kinetics parameters like activation energy of relaxation structure E_t , activation energy of crystallization E_c and order of crystallization have been calculated for every glass composition. Number of bonds per unit volume (n_b) and average stretching force constant (have been calculated to interpret the experimental data). Transparent glass ceramics were prepared by controlled one step heat treatment method. The crystal structure was investigated by using X-ray Diffraction (XRD) and Scanning electron microscopy (SEM). The XRD results and SEM micrograph reveal the presence of two crystalline phases: αTeO_2 and $\text{Zn}_2\text{Te}_3\text{O}_8$ phases during the crystallization process of the prepared glass. Optical absorption studies are carried out on the glassy system in the wavelength range of 300–900 nm. The cut-off wavelength λ_c , optical band gap E_{opt} , Urbach energy ΔE and refractive index n values were calculated. Also, different physical parameters such as, molar refraction RM , metallization criterion M , electronic polarizability of the oxide ion $\alpha_{O^{2-}}$ (calculated from E_{opt}) and optical basicity Λ have been determined.

Biography

Nehal Elkhoshkhany is an Assistant Professor of solid state physics. She has completed her PhD from Menofia University and Postdoctoral studies from Alexandria University, Material Science Department, Institute of Graduate Studies and Researches. She is the Director of Glass and Ceramic laboratory. She has published more than 10 papers in reputed journals. She is founding member in "The Arab Society of Materials Science".

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