Photo- and radioluminescence of willemite in ZnO-Al_2O_3-SiO_2 glass system

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In recent years, glass systems containing ZnO, Al_2O_3, and SiO_2 as main components have been investigated for the possibility of developing glass-ceramics. In particular, technology for creation of nanocrystalline phases, which depends on chemical composition and heat treatment temperature, is being sought [1,2]. Research in the aforementioned glass system focuses mainly on gahnite (spinel $ZnAl_2O_4$) and willemite (rhombohedral Zn_2SiO_4), which are interesting for their use in optics and photonics. The willemite phase, especially, has been shown to exhibit interesting and strong radioluminescence [3].

Our contribution describes glass-melting processes, composition, microstructure and especially optical properties of a large set of samples. Melt-quenching method and aerodynamic levitation with laser heating were used to prepare the samples. Both methods used to prepare willemite glass ceramics were compared. Chemical composition and microstructure was checked by XRF, XRD, SEM or EDS. Absorption, photoluminescence and radioluminescence spectra were measured. The special attention is paid to relationships between composition, structure of the glasses/glass ceramics and used technology.

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