

SPECTROSCOPIC AND NEUTRON DIFFRACTION INVESTIGATIONS ON GLASSES AND GLASS-CERAMICS IN THE $\text{Na}_2\text{O}/\text{BaO}/\text{TiO}_2/\text{B}_2\text{O}_3/\text{SiO}_2/\text{Al}_2\text{O}_3$ SYSTEM

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Glasses were synthesized in the system $\text{Na}_2\text{O}/\text{BaO}/\text{TiO}_2/\text{B}_2\text{O}_3/\text{SiO}_2/\text{Al}_2\text{O}_3$ using a traditional melt-quenching technique and thereon based glass-ceramics were prepared by applying different time-temperature crystallization programs to the glasses.

The structures of the obtained glasses and selected glass-ceramics were investigated using Fourier-transformed infra-red and Raman spectroscopy and the presence of SiO_3 , SiO_4 , Si_2O_7 , BO_3 and BO_4 structural units was proposed. Additionally, the occurrence of multiple pre-nucleation clusters inhomogenously distributed in the glass matrix with compositions close to that of the barium titanate phase, BaTiO_3 could be suggested from the IR-data processing.

The phase composition of the prepared glass-ceramics was initially determined by conventional X-ray diffraction and further investigated by Raman spectroscopy. Thus, as main crystallizing phases BaTiO_3 and barium fresnoite, $\text{Ba}_2\text{TiSi}_2\text{O}_8$ were identified.

Additional information regarding the crystallization behaviour and phase formation for the glasses was gathered by using in situ crystallization combined with neutron diffraction analysis. The neutron diffraction data reveals crystallization of BaTiO_3 in all compositions. The authors express their gratitude to the Bulgarian National Science Fund, contract KII-06-H28/1 for the financial support.