

Synthesis and Characterization of Nano-Sized Ferrimagnetic Particles with Application in Medicine and Sensor Technology

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Oxide glasses with high concentrations of 3d-metals and based on them glass-ceramics containing ferrimagnetic nanocrystals are of both fundamental and practical interest due to their interesting electrical and magnetic properties. Depending on the phase composition, size and volume fraction of the formed particles, the precipitated crystals are applied as parts of ferrofluids in magnetic resonance imaging and in biomagnetic sensors for the detection of different chemical and biochemical substances.

In the present investigation, glasses from the system $\text{Na}_2\text{O}/\text{MnO}/\text{SiO}_2/\text{Fe}_2\text{O}_3$ are prepared using conventional glass-melting technique and after applying appropriate time-temperature programs, magnetic nanocrystalline phase is precipitated in them. The phase composition and microstructure of the formed glass-ceramics is studied by x-ray diffraction, scanning and transmission electron microscopy. Anomalous small-angle x-ray scattering experiments are used to gather information about the chemical composition and element distribution in the formed nanocrystals as well as to estimate their size-distribution.