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Transparent glass ceramic containing NdF₃ nanocrystals for magneto-optical application

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ABSTRACT

In this paper, transparent 50SiO₂–18Na₂O–21Al₂O₃–11NdF₃ glass ceramic has been fabricated as a potential magneto-optical material to substitute for the glass. The X-ray diffraction analyses (XRD) and transmission electron microscopic (TEM) observation demonstrate that the near spherical NdF₃ nanocrystals with 8–16 nm in size homogeneously distributed among the glassy matrix after thermal treatment. The crystallization kinetics studies shows the average activation energy E_a to be 214 kJ/mol and the mean Avrami exponent n to be 1.28, indicating the crystallization a diffusion-controlled growth process of particles in the glass with decreasing nucleation rate. Magnetic properties measurements suggest that after thermal treatment, the magnetic susceptibility decreases.

KEYWORDS: nanocomposite, microstructure, NdF₃, magneto-optical