

Paramagnetic probes for nano-crystalline phase detection in oxyfluoride glass ceramics

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Paramagnetic probes – impurity ions that are detected by electron paramagnetic resonance (EPR) spectroscopy methods – can be used to study the structure of glasses and observe the formation of nano-crystalline phase in glass ceramic samples.

In this work, $46\text{SiO}_2\text{-}20\text{Al}_2\text{O}_3\text{-}8\text{CaCO}_3\text{-}26\text{CaF}_2$ oxyfluoride glass and glass ceramic samples treated at different temperatures containing 0.1% Gd^{3+} , Cu^{2+} and Cr^{3+} impurities have been studied by EPR at low temperatures. EPR measurements show that these paramagnetic probes in small concentration are suitable for the crystalline phase formation detection in oxyfluoride glasses. The calculations of EPR spectra fine structure parameters allow to identify the structure of the crystalline environment surrounding the paramagnetic probe. Additional differential thermal analysis (DTA) measurements confirm the crystallization of CaF_2 in the studied glass composition at approximately 700°C temperature.

In this report, the structure of paramagnetic probes in oxyfluoride glass ceramics will be discussed by comparing experimental results with spectral simulations.

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