Solid state NMR and pulsed EPR techniques as complementary tools for the elucidation of rare-earth coordination environment in glasses

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Abstract

Rare-earth containing glasses are important materials with technologically relevant combinations of mechanical and optical properties. For developing their functional materials potential it is important to understand the local environment and spatial distribution of the rare-earth ions and their influence upon the structural organization of the glassy matrix. Nuclear magnetic resonance (NMR) and electron paramagnetic resonance (EPR) can furnish crucial information about these aspects. While solid state NMR can give important information about the glassy network structure, EPR spectroscopy gives information about the coordination environment of paramagnetic rare-earth species. A draw back of the employed pulsed EPR techniques is the lack of quantitative information. To solve this issue, we have used Solid state NMR of diamagnetic rare-earth "mimic" species in order to sought quantitative information regarding the rare-earth ion coordination environment. Structural characteristics are correlated to optical properties in order to sought fundamental aspects of the luminescence properties.