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Competitive nanocrystallization of Na₃ScF₆ and NaYbF₄ in aluminosilicate glass and optical spectroscopy of Ln³⁺ dopants

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Abstract

The precipitation of monoclinic Na₃ScF₆ nanocrystals from aluminosilicate glass with specially designed compositions of SiO₂-Al₂O₃-Na₂O-NaF-ScF₃-YbF₃ was achieved for the first time. Impressively, competitive nanocrystallization of cubic NaYbF₄ and monoclinic Na₃ScF₆ has been evidenced to be dependent on Na⁺ content and F/Na ratio in glass. Adopting Er³⁺ and Eu³⁺ dopants as structural probes, optical spectroscopic analyses verified that these emissive centers preferred to partition into NaYbF₄ nanocrystals rather than Na₃ScF₆ ones.

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