

Room temperature synthesis of β -NaGdF₄:RE³⁺ (RE = Eu, Er) nanocrystallites and their luminescence

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Hexagonal β -NaGdF₄ is well established as a host lattice for upconversion luminescence materials [1]. Nanomaterials capable of upconversion luminescence are currently receiving high interest for application in biological imaging [2]. Moreover, β -NaGdF₄ doped with Eu³⁺ is an efficient quantum cutting material [3]. A room temperature synthesis was developed for phase pure β -NaGdF₄ nanocrystallites as well as 5% Eu³⁺ or 5% Er³⁺ doped material by converting rare

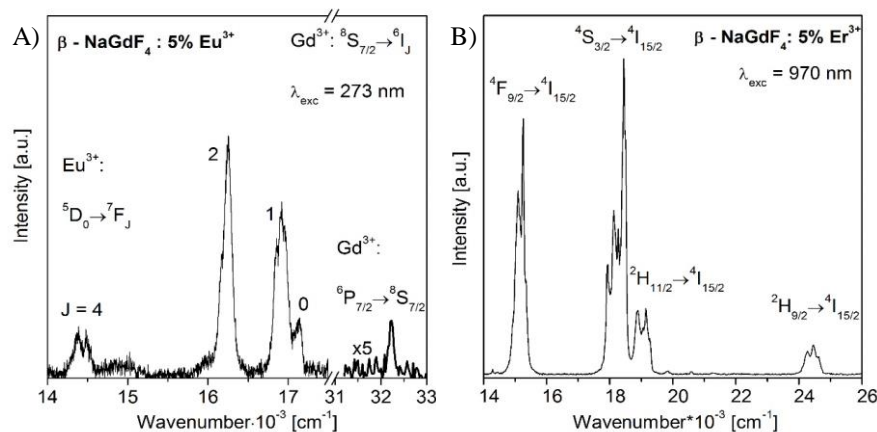


Fig. 1. A) Emission spectrum of β -NaGdF₄: 5% Eu³⁺ nanocrystallites for Gd³⁺ excitation at 273 nm (36630 cm⁻¹); B) Upconversion luminescence of β -NaGdF₄: 5% Er³⁺ nanocrystallites under 970 nm (10309 cm⁻¹) excitation.

The Eu³⁺-doped samples show red ⁵D₀→⁷F_J luminescence after Eu³⁺ excitation at 394 nm or Gd³⁺ excitation at 273 nm and 308 nm. The Er³⁺-doped samples show green and red upconversion luminescence from the ²H_{11/2}+⁴S_{3/2}→⁴I_{15/2} and ⁴F_{9/2}→⁴I_{15/2} transitions, respectively, after 970 nm excitation.

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earth acetates and NaCl in a 1:2 ratio with a variable excess of NH₄F in ethylene glycol within 24 hours. Since the thermodynamic stability of the hexagonal phase decreases along the lanthanide series [4], a larger amount of NH₄F was required for the synthesis of samples doped with the smaller Er³⁺ ions than for Eu³⁺ doped or pure NaGdF₄.