

SYNTHESIS OF SODIUM YTTRIUM FLUORIDE VIA HYDROTHERMAL METHOD AND CHARACTERIZATION

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Various rare-earth doped fluorides caught scientist attention recently as promising luminescent materials. One of those is sodium yttrium fluoride, which is interesting host to be doped with rare-earth ions as it possess appropriate optical properties, is thermally stable and biologically inert material [1].

Not only size of the particles but shape as well is responsible for various physicochemical properties of material, including luminescence. Rare earth doped fluorides can be applied as phosphors in light emitting diodes (LEDs), solid-state lasers, displays, solar cells, as anti-counterfeiting agents and so on [2]. NaYF₄ can also be applied in biomedical field as well - as bio-imaging/theranostic particles or as drug delivery probes [3].

Herein we report synthesis route to obtain single-phase NaYF₄ particles under hydrothermal conditions. Desired morphology (spheres, rods) can be obtained by altering pH value and amount of coordinating agent (malonic acid) within reaction mixture. Obtained particles were analyzed by means of using X-Ray diffraction (XRD), scanning electron microscopy (SEM).

Further plans are to improve this synthesis route in order to obtain monodisperse particles and to dope them with rare-earth ions.

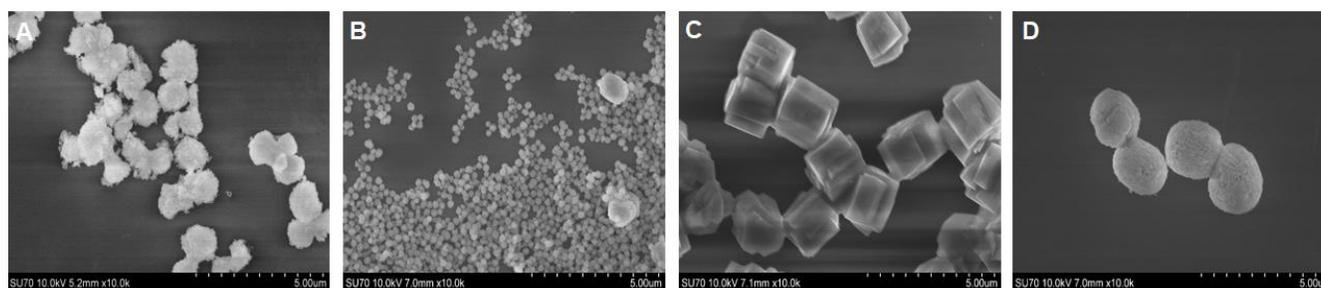


Figure 1. SEM images of NaYF₄ particles synthesized via hydrothermal method using different pH: a) 1; b) 5; c) 7; d) 10.

[1] Runowski, M. and Lis, S., *Nanocrystalline rare earth fluorides doped with Pr³⁺ ions*. Applied Surface Science, 2014. **320**(0): p. 742-745.

[2] Wang, Z., et al., *Synthesis and enhancement of red UC luminescence properties of ordered hexagonal NaYF₄:Yb³⁺/Er³⁺ nanowire arrays*. Journal of Fluorine Chemistry, 2011. **132**(12): p. 1012-1039.

[3] Liang, X., et al., *Synthesis of hollow and mesoporous structured NaYF₄:Yb,Er upconversion luminescent nanoparticles for targeted drug delivery*. Journal of Rare Earths, 2017. **35**(5): p. 419-429.