Nanocomposites and nanomaterials

Microwave-hydrothermal synthesis of rare earth doped YPO_4 and $YPO_4 \cdot 0.8H_2O$ nanoparticles

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Luminescent crystalline nanoparticles of rare earth compounds are admitted to be perspective for a number of biomedical applications, including both diagnostics and therapy [1], since they meet the requirements on toxicity, dispersability and luminescent properties (for diagnostics applications).

We report the microwave-hydrothermal synthesis of rare earth (Ce^{3+}, Nd^{3+}) doped yttrium phosphate nanoparticles. This method allows for obtaining contaminant-free nanoparticle colloids in aqueous media, which are essential for further application. We study the morphology, phase composition and luminescent properties of the material by means of TEM, XRD and luminescence spectroscopy, respectively. The XRD analysis reveals that the rhabdophane-like $YPO_4 \cdot 0.8H_2O$ phase nanoparticles can be obtained (as well as ones of the well-known tetragonal YPO_4 phase). The mean size of the synthesized nanoparticles is 40-60 nm, and the nanoparticle shape depends on the phase. The luminescent properties [2] of two phosphate phases are studied in comparison with each other. They can be further improved by the high temperature post-treatment, though the dispersability of the annealed nanoparticles decreases significantly.

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2. *Popov A.V., Orlovskii Yu.V., Vanetsev A.S., Gaitko O.M., Orlovskaya E.O., Sildos I.* Nanosecond fluctuation kinetics of luminescence hopping quenching originated from the $5d^1$ level in the Ce^{3+}:$YPO_4 \cdot 0.8H_2O$ nanocrystals // Journal of Luminescence.-2013.-**145.**-P. 774-778.