

Controlled synthesis of NaYF₄: Yb/Er Upconversion Nano/Microcrystals

Chunning Sun¹, Prof. Michael Gradzielski¹

¹ Stranski-Laboratorium für Physikalische und Theoretische Chemie, Institut für Chemie, Technische Universität Berlin, 10623 Berlin, Germany

Lanthanide-doped upconversion materials have become known as efficient luminescent materials owing to their long luminescence lifetimes, sharp-band emission, low toxicity, as well as their excellent physical and chemical stability [1-3].

NaYF₄: Yb/Er upconversion nano/microcrystals with different morphologies and sizes have been synthesized via a facile solvothermal approach using the disodium nitrilotriacetate as capping agent. X-ray diffraction (XRD), scanning electron microscopy (SEM) and photoluminescence (PL) spectra were carried out to characterize the products.

The results show that the solvent plays an important role in controlling the morphology and crystallinity of the final products. The crystal phase transition from cubic to hexagonal phase mainly depends on the volume ratio between the mixed solvents (EG and H₂O), which could be confirmed by the characterization of SEM and XRD. Upconversion PL properties are proved to be strongly associated with their phase structure and morphology of synthesized crystals, as shown in Fig. 1-3. In this fashion we are able to control the upconversion performance of these crystals via their formation process, which is an important tuning parameter for their future application.

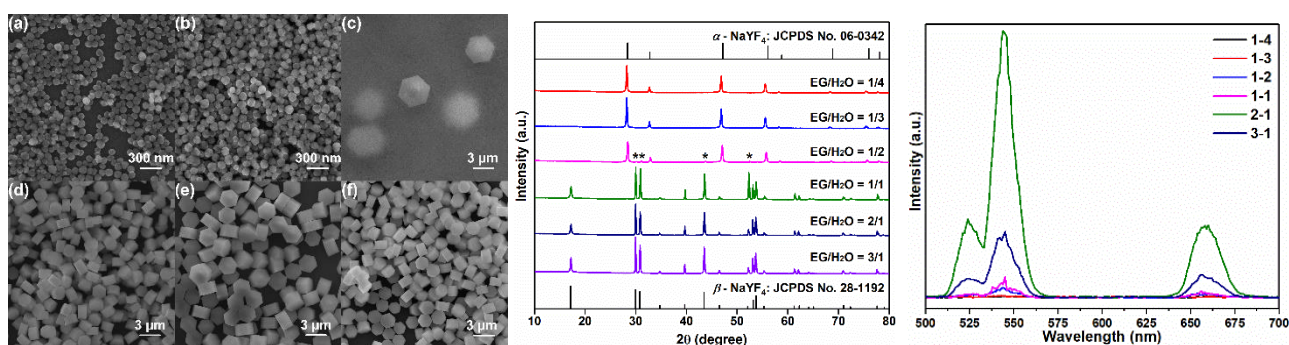


Fig. 1-3 SEM images, XRD patterns and PL of NaYF₄: Yb/Er prepared at different volume ratios of EG/H₂O (left to right)

[1] G Wang, *Accounts of Chemical Research* 2011, **44** (5), 322-332.

[2] Y Chien, *ACS Nano* 2013, **7** (10), 8516-8528.

[3] L Cheng, *Angewandte Chemie International Edition* 2011, **50** (32), 7385-7390.