Lithuanian chemists conference

Chemistry & Chemical Technology

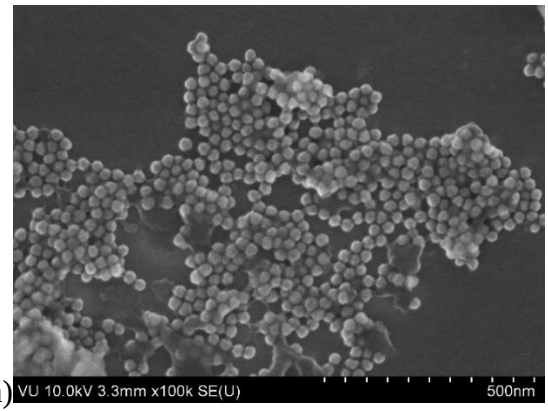
Vilnius University Press

UPCONVERSION LANTHANIDE-DOPED NAYF4 NANOCRYSTALS COATED WITH SILICA SHELL

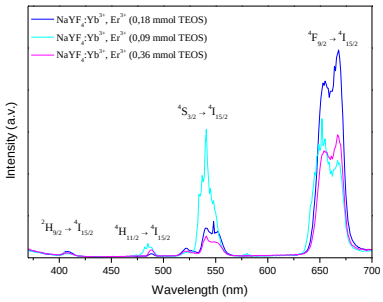
I. Lebedyte, I.Mikalauskaite,
G. Pleckaityte, A. Beganskiene,
A. Kareiva
Faculty of Chemistry and Geosciences, Vilnius University, Naugarduko st. 24, LT-03225 Vilnius, Lithuania,
** E-mail: aldona.beganskiene@chf.vu.lt*

Organic dyes, fluorescent proteins and quantum dots have been used widely for biolabeling and tissue imaging, but their emerged toxicity and other drawbacks have led to the search of alternative fluorescent probes. Upconverting nanoparticles, which are excited by IR rays to emit visible light, have garnered much attention. They are superior to dyes used previously due to their deep tissue penetration, chemical stability, low cellular toxicity and intense, high resolution images without the need of UV ray excitation [1-3]. Here we demonstrate the synthesis and characterization of water dispersible erbium and ytterbium doped upconverting NaYF4 nanoparticles.

In order to find out upconversion emission dependence on surface properties the lanthanide-doped upconverting NaYF4 nanoparticles with different functional groups on surface were synthesized. In this research α- and β-phase NaYF4 upconverting nanoparticles doped with Yb^{3+} (20%) and various concentrations of Er^{3+} (0÷5%) were synthesized via thermal decomposition method at 300-330°C in oleic acid and 1-octadecene. Upconverting nanoparticles were modified via Stöber or microemulsion methods using NaYF4:Yb3+ (20%), Er^{3+} (2%), tetraethyl orthosilicate (TEOS) or/and (3-aminopropyl)triethoxysilane (APTES), ammonia and cyclohexane. Synthesized materials were characterized by X-Ray powder diffraction (XRD), scanning electron microscopy (SEM), upconversion luminescence properties were measured with Edinburgh Instruments FLS980 (980 nm excitation) spectrophotometer.



a)



b)

1.Fig. a) SEM image of NaYF4:Yb^{3+}(20%), Er^{3+}(2%) nanostructures, b) luminescence spectra after surface modification using microemulsion method and different TEOS concentration (under 980 nm excitation).

Acknowledgments: This research was funded by a grant SINALAN (No. S-LU-18-13) from the Research Council of Lithuania.

References

1. M. Wang, G. Abbineni, A. Clevenger, C. Mao, S. Xu, Nanomedicine:Nanotechnology, Biology, and Medicine, **7** (2011), 710-729.

2. J. C. Boyer, M. P. Manseau, J. I. Murray, and C. J. M. van Veggel, Langmuir, **26** (2010), 1157-1164.

3. M. Haase, H. Schafer, Angewandte Chemie International Edition, **50** (2011), 5808-5829.