Smart Materials: Methods and Applications – 2017 (SMMA-2017)
PP13

Enhanced Ln^{3+} ions Luminescence from Ln^{3+}-doped Nanocrystals via Sensitization and its Application

Tuhin Samanta[1] and Venkataramanan Mahalingam*[1]

[1] *Department of Chemical Sciences, Indian Institute of Science Education Research (IISER) Kolkata Mohanpur - 741 246*

*Email: mvenkat@iiserkol.ac.in

Lanthanides (Ln3+) ions-doped materials have unique properties like sharp luminescence arising from downconversion/upconversion,longer lifetimes, large Stokes shift, etc. These properties of Ln3+-doped materials find various applications such as developing optoelectronic devices, lasers, bio imaging, solar cell, etc. However, one of the limitations of the Ln3+ ions is their low absorption coefficient resulting in low luminescence quantum yield (QY). Our strategy is to improve QY of Ln3+-doped materials via sensitization.1 Our first approach is to utilize suitable organic ligands as capping agent and sensitizer. This is achieved by attaching 4,4,4-trifluoro-1-phenyl-1,3 butanedione (TPB) to the surface of Eu3+-doped LiYF4 nanocrystals (NCs). The strong absorbance and energy level overlap of TPB ligands with Eu3+ ions resulted in efficient energy transfer from TBP ligands to Eu3+ ions. The broadband ultraviolet excitation and intense red emission of Eu3+ ions have been explored for the enhancement of solar cell efficiency.2 A ~9 % relative enahncement of photocurrent is noted upon UV excitation. In another approach, Eu3+ ions were sensitized using carbon dots (C-dots) in Eu3+-doped LaF3-C dots nanocomposites.3 This C-dots have high absorbance in ultraviolet (UV) region. Upon UV excitation, C-dots emit in the range of 370 nm to 500 nm and efficiently transfer energy to Eu3+ ions. This energy transfer via C-dots leads to the broadband excitation of Eu3+ ions can have potential use in phosphor based LEDs or solar cell.

***References*:**

1. Buenzli, J. C. G.; Piguet, C. *Chem. Soc. Rev.* **2005**, *34*, 1048.
2. Carlos, L. D.; Sá Ferreira, R. A.; Rainho, J. P.; Bermudez, V. de Zea. *Adv. Func. Mater.* **2002**, *12*, 819.
3. Samanta, T.; Hazra, C.; Mahalingam, V. *New J. Chem.* **2015**, *39*, 106.