

RE doped Nanorods : synthesis, alignment, and anisotropic optical properties

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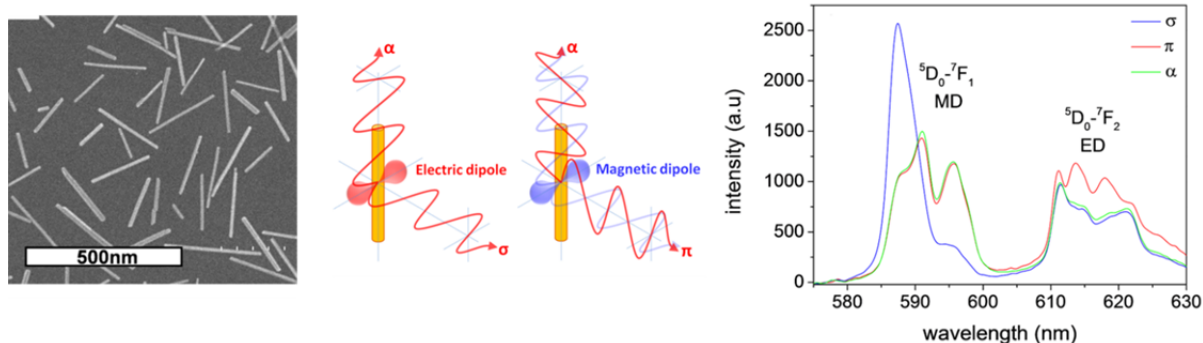
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Luminescent nanoparticles have been the subject of numerous investigations in the context of understanding physical properties of nanomaterials (size/surface effects), but also with the motivation of applications in different fields such as biological labeling or light emitting devices. Our group has largely focused his attention on rare earth doped nanoparticles with special emphasis on compounds such as $\text{YVO}_4\text{:RE}$, $\text{LaPO}_4\text{:RE}$ or YAG:Ce .

More recently, we have been more specifically interested in colloidal nanoparticles exhibiting both a crystalline anisotropy and an anisotropic shape such as nanorods. The main interest arises from the combination of anisotropic optical properties (polarized luminescence, birefringence) and the possibility to get macroscopic spatial orientation of nanorods suspensions either through self-assembly leading to liquid crystal phases, and/or through the application of external stimuli such as an electric field or shear in a solvent flow. This offers a way to develop active systems in which the particles orientation allows a significant modulation of optical properties.

This talk will present the work done in our group considering LaPO_4 and NaYF_4 nanorods. First part will be devoted to elaboration and functionalization issues toward concentrated suspensions with a controlled aspect ratio. Different strategies of rods alignment will then be presented using orientation under a solvent flow or through the application of an external electric field. The optical properties of the aligned assemblies will be presented, both considering optical birefringence and polarized emission. This will allow to finally discuss on some possible applications in optical devices and microfluidics.



TEM image of $\text{LaPO}_4\text{:Eu}$ nanorod and typical polarized emission spectra of aligned particles

- 1) de la Cotte, A et al. Soft Matter 11(33) 6595 (2015) - DOI: 10.1039/C5SM01427A
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- 3) Kim JW Adv. Mat. 25(24) 3295 (2013) - DOI: 10.1002/adma.201300594
- 4) Kim JW Adv. Funct. Mat. 22, 4949 (2012) – DOI : 10.1002/adfm.201200825