

Title : Rare earth doped nanocrystals: Nano-sources of light for novel applications to medicine, energy harvesting, and quantum optics

Name : Thierry Gacoin / Jongwook Kim

Laboratory : LPMC

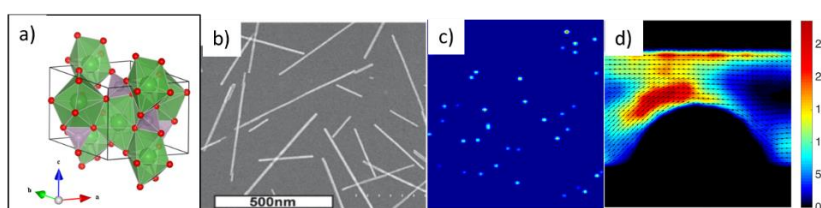
Email : thierry.gacoin@polytechnique.edu / jong-wook.kim@polytechnique.edu /

Webpage : <https://pmc.polytechnique.fr>

Research Area: Materials Science, Optics, Biophysics, Quantum Science and Technology

Methods: Nanocrystal elaboration, Microfluidics, Nano-optics, Luminescence spectroscopy, Confocal microscopy

PhD track subject: Since the discovery of quantum dots 30 years ago, now an essential tech-material used in displays or biomedical imaging, luminescent nanocrystals have been a principal subject of research. Doping rare earth elements in nanocrystals of oxides or halides enables outstanding emission properties such as 'lasing' and 'quantum cutting' originating from their *f*-electrons. Our group has pioneered the fundamental physics and chemistry of rare earth nanomaterials, and today develops their novel applications in biomedical analysis, microfluidic energy harvesting systems, and quantum optical materials. This PhD track project proposes early-graduate students to join our team and build his/her own project linked to our current topics.



Crystalline structure (a) and electron microscopy image (b) of LaPO₄:Eu nanorods. Luminescence microscopy image of single particles deposited on a surface (c). Shear flow tomography within a constricted microfluidic channel obtained from dispersed nanorods polarized luminescence (d)

References:

Jongwook Kim et al, *Nature Nanotechnology*, 12, 914 (2017)

Elodie Chaudan et al, *J. Am. Chem. Soc.* 140, 30, 9512 (2018)

Jeongmo Kim et al, *Nature Communications*, 12, 1943 (2021)