



Department of  
Mechanical Engineering  
The University of Hong Kong



Revised

## SEMINAR

# Photon Conversion Nanocrystals: Transforming Imaging and Assistive Technology

(onsite and online)

**Speaker:** Prof. Xiaogang Liu  
Department of Chemistry and Center for Nanomedicine  
National University of Singapore and Institute of  
Materials Research Engineering  
A\*STAR  
Singapore



**Date:** 23 February, 2023 (Thursday)

**Time:** 11:00 a.m. (Hong Kong Time)

**Venue:** Tam Wing Fan Innovation Wing Two, HKU

### Join Zoom Meeting:

<https://hku.zoom.us/j/93166355769?pwd=TIJOV3VzZFF1S3ZCZ3FBZFNqMFIxQT09>

**Meeting ID:** 931 6635 5769

**Password:** 004310

### Abstract:

Lanthanide doping in optical nanomaterials is a rapidly growing field of research, as it has the potential to significantly improve the efficiency of energy conversion processes and enable new applications in a wide range of technologies. One of the key advantages of using lanthanides as dopants is their ability to absorb and emit light at specific wavelengths, which can be precisely controlled by the choice of lanthanide ion and the doping concentration. This makes them useful for frequency conversion, where light of one wavelength is converted into light of another wavelength. One of the most promising areas of research in this field is in the area of photon upconversion, where low-energy photons are converted into higher-energy photons. In this talk, I will highlight recent advances in the development of these frequency conversion nanocrystals for multimodal imaging, bio-detection, therapy, and X-ray scintillation.

and assistive technology. I will also present recent efforts to develop electronic assistive technology prototypes that demonstrate the power of technology to improve the lives of individuals with disabilities.

### **Biography:**

Dr. Xiaogang Liu received his B.Eng. from Beijing Technology and Business University, Beijing, China (1992-1996), his M.Sc. in Chemistry from East Carolina University, Greenville, North Carolina, USA (1999), and his Ph.D. from Northwestern University, Evanston, USA (2004). After spending two years as a postdoctoral researcher in the Department of Materials Science and Engineering at MIT, he joined NUS in 2006 and was promoted to Full Professor in 2017. Since 2018, Dr. Liu has been a Provost's Chair Professor in the Department of Chemistry at NUS.

Among his research interests are the study of energy transfer in lanthanide-doped nanomaterials, the application of optical nanomaterials for neuromodulation, the development of advanced X-ray imaging scintillators, and the prototyping of electronic tools for assistive technologies.

His group has led to the controlled synthesis of luminescent upconversion nanoparticles (*Nature* **2010**, 463, 1061; *Nature Mater* **2011**, 10, 968; *Nature Commun* **2016**, 7, 13059; *Nature Nanotech* **2015**, 10, 237; *Nature Photon* **2021**, 15, 732) and their utility for ultrasensitive detection of biological molecules (*Nature Mater* **2014**, 13, 157), 3D volumetric display (*Nature Nanotech* **2015**, 10, 237), anticounterfeiting (*Nature Commun* **2017**, 8, 899), and instantaneous Brownian velocity measurement (*Nature Nanotech* **2016**, 11, 851). His team has developed fundamental methodologies for luminescence enhancement of optical nanomaterials (*Nature Nanotech* **2019**, 14, 1110; *Nature Commun* **2019**, 10, 1391; for a review: *Nature Mater* **2023**, in press), explored the basic relations between their structures and physical or chemical properties (*J Phys Chem C* **2019**, 123, 1711151), and applied them to the fields of optogenetics (*Science* **2018**, 359, 679), super-resolution imaging (*Nature Commun* **2015**, 6, 8832; *Nature Nanotech* **2021**, 16, 975; *Nature Commun* **2022**, 13, 6636), X-ray, gamma-ray/mid-infrared imaging (*Nature* **2018**, 561, 88; *Nature* **2021**, 590, 410; *Nature Photon* **2021**, 15, 187; *Nature Nanotech* **2021**, 16, 1011; *Nature Photon* **2022**, 16, 712; *Nature Photon* **2023**, in press) and optoelectronics (*Nature Mater* **2015**, 14, 685; *Nature Photon* **2019**, 13, 406; *Nature* **2020**, 587, 594; *Nature Mater* **2021**, 20, 1539), immunotherapy (*Science Adv* **2020**, 6, eabb2712; *JACS* **2023**, 144, 16366), and assistive technologies (*Nature Electron* **2022**, 5, 682; *Nature Biomed Eng* **2023**, in press).

Dr. Liu's work has been recognized with several national and international awards. He received the Chemical Society Reviews Emerging Investigator Lectureship Award (2012), the Taiwan National Science Council Lectureship Award (2012), the 41st International Conference on Coordination Chemistry Rising Stars Lectureship Award (Singapore 2014), President's Science Award (Singapore 2016), and the NUS Outstanding Researcher Award (2017). He was a Chang Jiang Scholar at Northwestern Polytechnical University from 2018-2023. He is a member of Singapore National Academy of Science (SNAS).

Dr. Liu is an associate editor of *Nanoscale*, *BMEMat*, *Journal of Luminescence*, and has served on editorial boards of *Journal of the Chinese Chemical Society*, *Journal of Physical Chemistry*

*Letters, Chemistry–An Asian Journal, Science China Materials, Advanced Optical Materials, InfoMat, The Innovation, Nanoscale Horizons, Small Methods, Next Technology, and Nano Letters.*

Homepage of Dr. Xiaogang Liu's research lab: <https://liuxg.science.nus.edu.sg/>

**ALL INTERESTED ARE WELCOME**

**For further information, please contact Prof. X.B. Yin at 3910 2659.**