

Molecular Rare-earth Material Systems for the Applications of Next-generation Photonic Integrated Technologies



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Hosted by: Prof. Handong SUN

Abstract

Molecular rare-earth materials uniquely combine the optical properties of rare-earth ions with the processibility of organic materials. This combination enables the development of cable and cost-effective integrated light source technologies. Rare-earth ions are particularly beneficial due to their long-lived optical and electronic states, ensuring the emitted light remains stable and predictable. In organic environments, there are significant drawbacks, primarily due to vibrational quenching effects, which couple nonradiative processes with rare-earth energy levels, reducing quantum efficiency and coherence properties. This talk will introduce our research on the correlation between organic vibrational modes, optical transitions and electronic states of rare-earth ions that emit technologically important telecom-compatible near-infrared wavelengths. Additionally, the talk will discuss the advantages of organic sensitisation in enhancing the power efficiency of rare-earth-based gain materials, previous R&D of developing integrated on-chip devices, and our recent studies regarding the potential applications of these materials in quantum optics.

Biography

Prof. Huanqing Ye is a Dame Kathleen Ollerenshaw Fellow and Assistant Professor at the Photon Science Institute and the Department of Electrical and Electronic Engineering at the University of Manchester since 2022. His current research interest focuses on the optical characterisation of nanophotonic materials and the development of active photonic integrated devices. He was the senior scientist at Chromosol Ltd, a spin-out company from Queen Mary University of London, from 2018 to 2022, leading the R&D of organic-integrated silicon lasers for photonics 2.0. He worked as a postdoctoral research fellow at Nanyang Technological University in Singapore from 2015 to 2018 and obtained a PhD in Physics at Queen Mary University of London in 2014. He authored over 30 research papers with an H-index of 16 and has participated in projects totalling £5M funding from Innovate UK and UK Research Innovation as co-investigators.