Tuning photoluminescence of metal-ion-doped phosphors

By

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Venue: Hilbert Space (PAP-02-02)
Host: Asst. Prof. Sun Handong

Abstract
Tuning and enhancement of photoluminescence (PL) of phosphors are imperative for understanding the physical processes of energy transition and widespread applications. In this talk, I will introduce oxide and fluoride phosphors doped with rare-earth and transition metal-ions, showing down-/up-conversion PL, low-voltage cathodoluminescence and magnetic properties. Tuning PL in the phosphors can be achieved through a conventional chemical approach, i.e. changing the composition of host materials and/or doping ions. Tuning of the optical properties of emission centers by tailoring the ligand fields is investigated. Multifunctional nanophosphors with both excitation and emission of luminescence in the near-infrared region suitable for the bio-imaging are produced. We have recently demonstrated that the enhancement and modulation of upconversion PL can be realized by applying relatively low voltages to Yb/Er co-doped ferroelectric thin films in situ and real-time manner. The presented approach for the tuning PL is in contrast to conventional chemical routes. I will also show that the obtained phosphors with tuning PL properties can provide potential applications such as display, optical communication, solar cell, solid-state lighting and bio-imaging. This work was supported by grants to JHH from the Research Grants Council of Hong Kong, Hong Kong Innovation and Technology Support Programme and Hong Kong Polytechnic University.

References:

Biography
Jianhua Hao obtained his BSc, MSc. and PhD at Huazhong University of Science and Technology, China. After his research at Penn State University, USA, University of Guelph, Canada and the University of Hong Kong, Dr. Hao joined the Department of Applied Physics, The Hong Kong Polytechnic University (PolyU) as assistant professor. The courses taught by Dr. Hao in PolyU include Semiconductor & Optoelectronic Devices, Display Technology and so on. Dr Hao’s research interest includes luminescent materials, oxide thin-film heterostructures and optoelectronic devices. He has published over 120 papers in peer-reviewed journals and conference proceedings. He is the principal inventor of an US patent. He has given many invited talks at international and national conferences. He serves on the Editorial Advisory Board Member of The Open Applied Physics Journal and others.

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