DEPARTMENT OF BIOMEDICAL SCIENCES
PRESENTS A SEMINAR

CityU
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MAGNETIC NANOPARTICLE AND LUMINESCENT QUANTUM DOTS FOR BIOMEDICAL APPLICATIONS

Prof. Xu Xueqing
Deputy Director, Solar Energy Laboratory
Guangzhou Institute of Energy Conversion (GIEC)
Chinese Academy of Sciences (CAS)

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TIME: 10:45 - 11:45
VENUE: P4703, 4/F, Yeung Kin Man Acad Building, CityU

Abstract:

In the last decade, the field of nanoparticles has seen a significant boom from synthesis, characterization, and functionalization to various applications. At the nanoscale, these particles exhibit unique physicochemical properties compared to bulk particles, enabling a variety of applications in the field of energy, catalysis, environmental remediation, and biomedicine.
Wherein, magnetic nanoparticles have attracted great attentions for its biomedical applications, such as magnetic fluids intracellular hyperthemia, magnetic targeting drug delivery system, magnetic cells separation, magnetic resonance imaging contrast enhancement, and so on. We have prepared dextran, carboxylmethyl-dextran (CD), and alginic acids (AC) coated magnetite (Fe3O4) nanoparticles (Applied Surface Sciences, 2005, 252(2): 494). Besides, the CD and AC coated Fe3O4 nanoparticles (named as Fe3O4@CD and Fe3O4@AC) have been coordinated with anti-cancer agent cis-dichlorodiamineplatinum (CDDP). It is found that Fe3O4@AC had as good CDDP loading capacities as Fe3O4@CD, and Fe3O4@AC loaded with CDDP was effective in suppressing human rhinopharyngocele CNE2 cells (Applied Surface Sciences, 2006, 253 (4): 2158; Chinese Science Bulletin, 2006, 51 (2): 151). To functionalize the dextran-coated magnetite nanoparticles with antibodies, the dextran-coated magnetite nanoparticles have been oxidized with sodium periodate, and its binding properties with bovine serum albumin (BSA) have been investigated.
Additionally, the unique photoelectronic properties of colloidal quantum dots have attracted wide attention in biomedical applications, such as single-molecule probes, real-time bioimaging and diagnostics. However, most of the traditional II-VI and III-V QDs contain highly toxic and carcinogenic heavy metal elements such as Cd, Pb, Hg, etc., or highly toxic anionic elements such as As and Te. In our group, an efficient green emission CuInS2/ZnS/ZnS core/shell quantum dots were synthesized using a low temperature (130℃) hot injection methods combined with multi-layers ZnS coating strategy (J. Alloy. Compd., 2015, 640：134; J. Alloy. Compd. 2021, 851, 10), and a maximum photoluminescence quantum yields of ~85% at peak wavelength of ~530 nm has been achieved. Besides, red emission CuIn(S,Se)2 quantum dots(J. Mater. Sci. 2019,54 (3), 2037) and InP-based red emission quantum dots have been developed (Journal of Materials Chemistry C 2021, 9 (30)：9599; ACS Appl. Nano Mater. 2022, 5 (2), 11; J. Lumines. 2023, 256, 9).
Recently, we are developing highly stable aqueous luminescence microsphere for multiplex immunity detection of biomarkers. Apart from this, some novel NIR QDs are investigated in our group for bio image applications.

Speaker:

Prof. Xu Xueqing, Deputy Director of Solar Energy Laboratory, Guangzhou Institute of Energy Conversion (GIEC), Chinese Academy of Sciences (CAS), member of CSTM Electronic Material Standards Committee, Director of Guangdong Materials Research Society, Executive Director of Shenzhen Solar Energy Society, Project evaluation expert of Ministry of Science and Technology, National Natural Science Foundation of China, and Guangdong Science and Technology Department. She has been engaged in the research of optoelectronic materials and devices, including luminescence colloidal quantum dot, optoelectronic functional films, perovskite solar cells, and quantum dot light-emitting diode. As the PI or co-PI, she has undertaken over 40 scientific research projects such as national "863" programme, National Natural Science Foundation, provincial and municipal science and technology research projects. She has published more than 130 academic papers in high quality journals, such as Energ Environ Sci, Adv. Funct. Mater., ACS Nano, Chem. Eng. J, J. Phys. Chem. C, ACS Appl. Mater. Interface, J. Mater. Chem. A, Solar Energy materials & solar cells, Journal of Applied Physics, and so forth, with total SCI citation more than 2,700 times, H-index 29. 1 invention patent application has been authorized by the United States and 15 national invention patents have been authorized. She has supervised 13 PhD students (4 of them graduated and presented their thesis, others are still on the program) and more than 15 master students.

All are Welcome!

Enquiries:
vivian.woo@cityu.edu.hk, 3442-4985