MSE-Colloquium@NTU

16 December 2015, 4.00pm
Lecture Theatre 5, Nanyang Technological University

Polymeric Micelle/Silica Nanocapsules for Bioimaging: Best Hybrid and Beyond

Professor John Wang
Department of Materials Science and Engineering
National University of Singapore

About the Talk

We have successfully developed a class of polymeric micelle/silica hybrid nanocapsules for multifunctional applications, such as bioimaging and controlled delivery. With the tunable structure and surface functionalization, several different types of contrast agents, such as fluorescent conjugated polymers, CdSe/CdS/ZnS quantum dots, MnO, and Fe3O4 nanocrystals, are encapsulated into micelle/silica dual shells. The nanocapsules possess a polymeric micelle framework stabilized by a controllable thin layer of silica confined to the micellar core/corona interface, and with free PEO chains dangling on the outer surface. The hybrid encapsulation follows a “green” approach that directly proceeds in a near neutral pH aqueous environment at room temperature, and therefore no detriment effects to the contrast agents and drug moieties. In further developing the new approach, fluorescence quenching of doxorubicin (DOX) is remarkably inhibited by modification of the hybrid shell with organic hydrocarbons, where the enhanced hydrophobicity leads to a more effective shielding of DOX from external quenchers such as dissolved oxygen. In addition to solid oxide nanocrystals, nanohollow crystals, such as MnO, designed for T1 contrast of MRI, with varying nanostructures are developed successfully through a facile approach of acetate buffer etching of the hybrid nanocapsules, where the acidic etching of MnO by acetate buffer solution is well controlled. We have conducted both in-vitro and in-vivo studies demonstrating that these organic/inorganic dual layer-protected nanocapsules conjugated with folate show noncytotoxicity, much enhanced fluorescence cellular imaging as well as high target specificity for controlled delivery.

About the Speaker

Professor John Wang is Professor and Head of the Materials Science and Engineering Department, and Senior Faculty Member, NUS Graduate School for Integrative Sciences & Engineering (NGS) in the National University of Singapore. He has more than 30 years of experience in education and research of advanced materials. His current research foci include: functional materials and devices, biomaterials and hybrids for bioimaging and healthcare, and novel materials for sustainable energy and development. Professor John Wang has published more than 300 papers in prestigious, top international refereed journals. He has been invited, on a regular basis, to give keynote/ invited lectures at major international conferences/ symposia/ workshops. Professor John Wang has supervised 50 postgraduate students and more than 30 postdoctoral/ research fellows. He is Fellow of the Institute of Materials, Minerals and Mining (UK).

NANYANG TECHNOLOGICAL UNIVERSITY

SCHOOL OF MATERIALS SCIENCE AND ENGINEERING