MSE-Colloquium@NTU

4 August 2015, 4.00 pm

Lecture Theatre 4, Nanyang Technological University

Spherical Mesoporous Architectures: Interfacial Assembly from Single- to Multi-Level and their Applications

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About the Talk

Functional mesoporous materials have large uniform pore sizes, uniquely ordered mesostructures, high surface area and large pore volume, showing great potential to be used in applications such as catalysis, adsorption, separation petroleum oil industry, and especially in drug delivery and biomedicines. Here, we present the development and progress of the synthesis of these spherical mesoporous materials from a surfactant assembly approach for use as drug carriers, fluorescence detection and diagnosis. We focus on the development of new synthesis approaches, including the liquid-liquid bi-phase synthesis, evaporation-induced aggregation assembly (EIAA), and interface driven orientation arrangement to create novel mesoporous nanospheres with one-level and multi-level architectures, such as the core-shell, yolk-shell structures for silica, TiO_2, carbon spheres and hemispheres, and Janus particles. These spherical materials with large uniform pore channels (>3.0 nm), high surface area (~1150 m^2/g), large pore volume (1.5 - 3.5 cm^3/g) and open framework are non-toxic, easily degradable, and can be used to remove body toxins, and function as carriers for controlling release of drugs. Further, these functional mesoporous materials show superior performance when used in hyperthermia infrared imaging (elevated temperature as high as 85°C at 808 nm).

References

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About the Speaker

Professor Zhao Dongyuan received his PhD from Jilin University in 1990. He is currently Professor of Materials and Chemistry (Cheung Kong and Hao Qing Professorship), and Head of the Laboratory of Advanced Materials at Fudan University, China. He is also the co-director of the Collaborative Innovation Center of Chemistry for Energy Materials (iChEM). His research interests are focused on the interfacial assembly and macroscopic control of ordered mesoporous molecular sieves for applications in catalysis, electrochemical capacitors and water purification. He has made many breakthroughs in the synthesis of ordered mesoporous materials, and has significantly contributed to the international mesostructured materials community. He has discovered families of novel ordered mesoporous materials, which have been widely used around the world. He holds 6 US patents and over 50 China patents. In addition, he has published over 550 scientific papers in international journals. His papers have been cited for more than 50,000 times and his h-index is 105. He was ranked 65th among the top-100 Most Cited Chemists by ISI (Thomson Reuters) and was acknowledged as one of the 48 top authors with the highest citations in the past 15 years by Advanced Materials in 2002. He has been invited to give more than 300 seminars at international universities and has received many international awards.

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