הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע"ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Special Seminar

Lecture Hall 6, Wolfson Department of Chemical Engineering,

31st May, 2016 at 14:30

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Functionalized materials for treatment of arsenic, fluoride, copper, and lead contaminated water: material development, process evaluation and engineering, and studies of mechanisms/modeling

Abstract

Due to rapid industrialization, both surface and ground-water has been contaminated in some of areas in developing countries. It is rather challenging to treat heavy metal contaminated water as the currently available technologies cannot well treat the wastewater, in particular, at lower concentration levels. In our laboratory, several functionalized materials have been developed to address the challenge. Zirconium (Zr) based materials have unique physical and chemical properties and are powerful in treatment of both anionic and cationic contaminants such as arsenic, fluoride, copper and lead. Environmental friendly biosorbents/biopolymers exhibit extremely higher uptake capacities and kinetics for heavy metals.

In this talk, the approaches for fabrication of functionalized nanoparticles (NPs), Zr-based NP embedded membranes, Zr-modified membrane and NP-biopolymer composite will be first presented. A series of research works will be presented to illustrate the applications of the technologies in the water treatment. In particular, the performance in the treatment of toxic substances such as arsenic, fluoride, copper and lead will be demonstrated in details. Our data show that the materials outperform the commercially available adsorbents, ion exchange resin and membranes through the studies on adsorption isotherm, adsorption kinetics and filtration. pH plays a key role in the treatment. The presence of competing substances such as natural organic matters seems to have less effect on the treatment. Such important issues as toxicity study of nano particles and industrial-scale application of the technology will be presented. The said materials can be recycled and reused through low-cost engineering measures, by which makes the technologies more sustainable for the industrial-scale water treatment. Finally, the removal mechanisms will be illustrated through a series of instrumental analysis (e.g., XPS and IR) together with several mathematical models.

Refreshments served at 14:15

Biography of Dr J. Paul Chen

Dr J. Paul Chen has been with the environmental engineering program in the National University of Singapore (NUS) since 1998. His research interests are physicochemical treatment of water and wastewater and modeling. He has published three books, more than 100 journal papers and book chapters with citation of above 4600 and H-index of 39 (ISI). He holds seven patents in the areas of adsorption and membrane technologies and ballast water management systems. He has received various honors and awards, including the Sustainable Technology Award from the IChemE, Guest Professor of the Hua Zhong University of Science and Technology, and Shandong University of China, and Distinguished Overseas Chinese Young Scholar of National Natural Science Foundation of China. He has also been recognized as an author of highly cited papers (Chemistry and Engineering) of ISI Web of Knowledge. His PhD students have received several internationally recognized awards, including Young Chemical Engineer in Research Award of IChemE (highly commended), Graduate Student Research Award of AIChE (Separations Division), NUS President's Graduate Fellowship, and the World Future Foundation (WFF) Ph.D. Prize in Environmental & Sustainability Research (Cash Prize of US$10,000). Professor Chen received his MEng degree from the Tsinghua University of Beijing and his PhD degree from the Georgia Institute of Technology of Atlanta, Georgia.