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Nanotechnology application in water and wastewater treatment

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Nanomaterials play an important role in the treatment of water and wastewater. Metal oxides based nanomaterials such asγ-$Fe_2O_3$and Fe_3O_4based magnetic nanoparticles and core-shell Fe_3O_4@SiO_2 structure magnetic nano-photocatalysts have been widely investigated for the removal and recovery of toxic contaminants from aqueous solutions because of their high surface area to volume ratio, high physic-chemical stability, biocompatibility, and efficient regeneration of spentnanoadsorbents. The magnetic nanomaterials can be characterized using X-ray diffractometer (XRD) for crystal identification, transmission electron microscopy (TEM) for size and morphology investigation, BET analyzer for surface area measurement, and vibrating sample magnetometer (VSM) for magnetic property and behavior analysis.

Surface and subsurface watercontamination has created great attention of environmental scientists and engineers to eliminate toxic contaminantsfrom wastewater before discharging into water bodies. Nowadays, it has become a hot topic to develop novel nanoscale adsorbent materials for the removal of toxic dyes, heavy metal and persistent organic pollutant (POP) under varying experimental conditions. Adsorption-desorption or photocatalytic degradation of pollutants from aqueous media to the interface of nanoadsorbents have been investigated to understand the contaminant removal performance using isotherm equations and kinetic sorption rate and to determine their removal mechanisms using FTIR, XPS and surface complexation modeling. In this presentation, recent advances in toxic dyes, heavy metal and POP removal from water and wastewater by magnetic nanoparticles and magnetic nano-photocatalystswill be presented in regards to their synthesis, characterization, applications and limitation.In order to further examine the compatibility of thesenovel magnetic sorbents in industrial application, a novel prototype flow-through treatment system through the combination of an electro-magnetic separation unit, and magnetic nanoparticles based contaminant removal process, including sorption, desorption, recovery and regeneration of the magnetic sorbents will be presented.

Biography:

Prof. Irene M. C. Lo is full professor at the Department of Civil and Environmental Engineering, The Hong Kong University of Science and Technology (HKUST). She is an elected Academician of European Academy of Sciences and Arts (EASA), elected Fellow of Hong Kong Institution of Engineers (FHKIE) and American Society of Civil Engineers (FASCE). Her Ph.D. (1992) is in Civil (Environmental) Engineering from University of Texas, Austin. She is Adjunct Professor of Tongji University, Tianjin University, Jilin University and Harbin Institute of Technology in China. She had been Visiting Professor at Technical University of Denmark and University of Wisconsin, Madison. She was the recipient of 2004 ASCE James Croes Medal, 2007 ASCE Samuel Arnold Greeley Award, 2008 EWRI Best Practice-Oriented Paper Award, 2009 ASCE Wesley W Horner Award and 2012 ASCE EWRI Best Practice-Oriented Paper Award. She has 2 patents, edited 7 technical books, and published over 260 SCI journal articles and conference papers with about 4500 citations and H-index of 35. Her research areas include remediation technologies for river sediment, contaminated soils and groundwater; magnetic nano- and microparticles for environmental pollution control; pollutant migration in soils; and waste treatment and management.