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Development of Synthetically Engineered Sorbent Materials for Waterborne Contaminants

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Recent studies have shown the utility of copolymer sorbent materials based on cross-linked polysaccharide scaffolds. Polysaccharide scaffolds represent a versatile scaffold for the design of sorbent materials because of their interesting host-guest chemistry. Synthetic engineering through chemical cross-linking offers a modular strategy for copolymer sorbent materials with tunable structural and physiochemical properties. In this presentation, an overview of recent research concerning the sorption properties of synthetically engineered sorbent materials and waterborne contaminants will be reviewed. The results of this research are anticipated to contribute favourably to technology concerning sorptive based removal of water borne contaminants and chemical separations.

Biography

Lee D. Wilson (Ph.D.-chemistry) is an Associate Professor of Chemistry at the University of Saskatchewan. He specializes in Physical Chemistry and Materials Science and is currently researching the development of new types of materials (e.g., molecular sponges) that will have a tremendous impact on areas such as the environment, biotechnology, medicine, chemical delivery/separation systems, and membrane materials for water purification. This research will be of great importance to Aboriginal communities in Canada that suffer from water quality and health issues and require point-of-use treatment strategies. Wilson completed a Ph.D. in Physical Chemistry from the University of Saskatchewan (1998) becoming the first Métis student to earn such a degree. Wilson is the recipient of several scientific and community awards including the Governor General's Gold Medal in the Physical Sciences & Engineering, 2004 National Aboriginal Achievement Award (Science and Technology), and the Saskatchewan 2006 Centennial Medal. In 2008, Wilson was nominated as "Scientist of the Month" by the Saskatchewan Science Network. Wilson has provided mentorship and inspiration to Aboriginal youth through the Innovators in the Schools Program, Canadian Aboriginal Science & Technology Society, and has developed science programs and camps for Aboriginal students at the University of Saskatchewan.

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Carbon nanotube electronics: Extending the Moore law to the end of the roadmap and beyond

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Carbon nanotubes (CNT) are quasi-one-dimensional materials with unique properties and are ideal material for nanoelectronics. In particular, perfect n-type and p-type contacts are now available, paving the way for a doping free fabrication of CNT based ballistic CMOS and high performance optoelectronic devices. The feasibility of this doping free CMOS technology has been demonstrated by fabricating CMOS circuits, including a full adder circuit, showing perfect symmetric device characteristics for the n-type and p-type CNT FETs. This may lead to the integration of CNT based CMOS devices or entire carbon based circuit with increasing complexity and possibly find its way into logic and optoelectronic circuits. The development of high performance CMOS circuits also requires high quality gate dielectric with high dielectric constant. Although various high-κ dielectrics have been demonstrated to be technically compatible with carbon-based devices, it is proved to be very difficult to grow uniform thin high-κ film directly on the surface of CNTs or graphene via a general method. Utilizing the excellent wetting behavior of yttrium on sp2 carbon framework, ultrathin (about few nm) and uniform Y_2O_3 layers have been directly grown on the surfaces of CNT and graphene without using noncovalent functionalization layers or introducing large structural distortion and damage. A top-gate CNT FET adopting this top-gate dielectric shows excellent device characteristics, including an ideal subthreshold swing of 60 mV/decade. The high electrical quality Y_2O_3 dielectric layer has also been integrated into a graphene.

Biography

Lian-Mao Peng received his B.S. in Physical Electronics from Peking University in 1982 and his Ph.D. in Physics from Arizona State University in 1988, and spent the following six years working at the University of Oxford. He returned to China in 1995, first as a senior research scientist at the Institute of Physics, Chinese Academy of Sciences, and then the Director of the Key Laboratory for the Physics and Chemistry of Nanodevices in 2004 and the Head of the Department of Electronics in 2007. He has published over 283 research papers, and a book entitled "High-energy electron diffraction and microscopy" (1994, Oxford University). He is a fellow of the Institute of Physics, UK, serves as the associate editor of the Journal of Applied Physics and as the chairman of the Electron Crystallography Commission, and International Union of Crystallography.

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