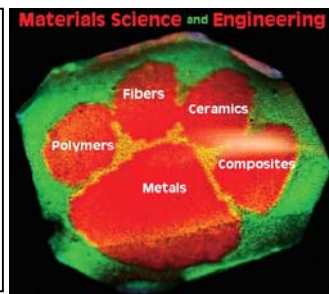


Seminar Series

Sponsored by
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Nanotubes, Nanodiamonds and Carbide-Derived Carbons with Tunable Size, Structure, Surface Chemistry and Properties

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Abstract

Carbon nanomaterials show a great promise for energy, biomedical, structural and other applications.¹ This presentation describes a variety of carbon nanoparticles, including nanotubes, nanodiamond, and carbon onions. Nanotubes have been receiving more attention than other nanomaterials, but nanodiamonds may offer a unique combination of physical and chemical properties as well. Nanodiamond powders (also called ultra-dispersed or detonation diamond) with the crystal size of ~4-8 nm combine an active surface, featuring a variety of chemically reactive moieties, with attractive properties of bulk diamond. Since properties of nanodiamond are mainly determined by its surface, control over the surface chemistry is required. The surface of the nanoparticles governs their dispersion behavior in solvents, interaction with the environment, biocompatibility as well as ability to form strong bonds with a matrix in composites. Oxidation, hydrogenation, chlorination, and amination of diamond surfaces will be reviewed and their effects on electrical and optical properties of diamond will be described. Extraction of metals from carbides can generate a broad range of potentially important carbon nanostructures known as Carbide-Derived Carbons (CDC). For example, heating of silicon carbide in vacuum results in graphene films or aligned nanotubes, depending on the crystal face of SiC and temperature. Extraction of metals from their respective carbides by chlorine at 200-1200°C results in the formation of micro- and mesoporous carbons with the specific surface area up to 2000 m²/g. CDC technology allows the control of carbon growth on the atomic level, monolayer by monolayer, with high accuracy. Design of CDCs for energy related (hydrogen sorption and supercapacitors) and biomedical (blood cleansing) applications will be particularly addressed in this presentation.

¹Y. Gogotsi, *Nanomaterials Handbook*, CRC Press, Boca Raton, FL, 2006, 800 pp.

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Bio



Dr. Yury Gogotsi is Professor of Materials Science and Engineering at Drexel University. He also holds courtesy appointments in the Departments of Chemistry and Mechanical Engineering at Drexel University and serves as Director of the A.J. Drexel Nanotechnology Institute. He received his MS (1984) and PhD (1986) degrees from Kiev Polytechnic and a DSc degree from the Ukrainian Academy of Science in 1995. His research group works on nanostructured carbons, nanofluidics, and pressure-induced phase transformations in ceramics and semiconductors. He has co-authored two books, edited 12 books, obtained more than 20 patents and co-authored about 250 papers.

He has received several awards for his research including I.N. Frantsevich Prize from the Ukrainian Academy of Science, S. Somiya Award from the International Union of Materials Research Societies, G.C. Kuczynski Prize from the International Institute for the Science of Sintering, R. Snow Award from the American Ceramic Society (3 times), R&D 100 and two NANO 50TM Awards. He has been elected a Fellow of the American Ceramic Society, Academician of the World Academy of Ceramics and Full Member of the International Institute for the Science of Sintering.