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TITLE

Carbon nanotube synthesis and applications: The multiscale approach

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"Nanotechnology has the potential to improve the properties of everything that humans currently make", said R. Stanley Williams, Senior HP fellow during his testimony before the Senate Subcommittee on Science. However, the development of nanotechnology remains slow because it lacks a rational design approach. This presentation will first discuss current progress and describes remaining challenges, and future research directions of carbon nanotube (CNT) synthesis. The growth of CNTs with predefined atomic structure and properties has a potential to play a central role in the field of nanotechnology. After that we focus on the rational computational design that has the potential to accelerate the development of new nanomaterials by guiding and focusing experiments and providing better understanding of highly-coupled, multiscale processes employed in nanotechnology. The critical barriers for achieving computational design of multiscale processes include (1) Lack of bridging models that span nano to macro scales; (2) Limited number of studies, which have been performed; and (3) Difficulties in applying existing software tools for new applications. Finally, we examine the current state of the art in the development of CNT-based high-current cold emission cathode for the next generation of wideband satellite communications. Existing satellite communication devices are based on a thermionic cathode that make them bulky and heavy, and take valuable volume and weight budget in a satellite. Miniaturization of these devises by using CNT-based cold emission cathode would result in significant cost savings in a satellite launch.

Biography

Dr. Alex V. Vasenkov is principal scientist at CFDRC. He received his Ph. D. degree in molecular physics and thermo physics from the Russian Academy of Science in 1996. In 1999-2003, he had a postdoctoral training at the UBC and the UIUC. With 16 years of experience, he is an expert in material design, plasma processing, self-assembly processing of nanomaterials, multi-scale modeling, Molecular Dynamics, Kinetic Monte Carlo and continuum mechanics. His research was funded by federal agencies (NSF, DOE, and DoD) and industry (Samsung Advanced Institute of Technology, etc.) He is the co-author of over 30 publications in peer-reviewed journals.