

Engineering Carbon Nanotube Architectures: Route to Applications

Pulickel M. Ajayan

*Department of Materials Science and Engineering
Rensselaer Polytechnic Institute, Troy, NY 12180-3590*

ajayan@rpi.edu

<http://www.rpi.edu/dept/materials/PMA/>

Abstract: Carbon nanotubes are fascinating materials from the point of view of structure, form, growth and properties. The biggest challenge however is to assemble nanotubes into various architectures useful for specific applications. The talk will focus on the recent developments in our laboratory on the fabrication of carbon nanotube based architectures tailored for various applications. Various organized architectures of multiwalled and singlewalled carbon nanotubes can be fabricated using relatively simple vapor deposition techniques. The work in attaining control on the directed assembly of nanotubes on various platforms will be highlighted. Our efforts on the strategies of growth and manipulation of nanotube-based structures and in controllably fabricating hierarchically branched nanotube and nanotube-hybrid structures will be discussed. We have pursued several novel applications for these structures, for example, as nanostructured electrodes for sensors, electrical interconnects, unique filters for separation technologies, thermal management systems, multifunctional brushes, and polymer infiltrated thin film and bulk composites. A perspective of the field based on the work done by the author over a period of more than decade will be presented here with highlights from recent work and thoughts on future implications of the field.

Dr. Pulickel. M. Ajayan received his Ph.D. in materials science and engineering from Northwestern University in 1989. After three years of post-doctoral experience at NEC Corporation in Japan, he spent two years as a research scientist at the CNRS laboratoire de Physique des Solides, Orsay in France and about a year and a half as an Alexander von Humboldt fellow at the Max-Planck-Institut für Metallforschung, Stuttgart in Germany. Professor Ajayan's research interests are mainly focused on the synthesis of nanostructures, the study of their structure and properties in relation to size and confinement. He is one of the pioneers in the field of carbon nanotubes and has demonstrated several possibilities for using these quasi-one-dimensional structures as templates and molds for fabricating nanowires, composites, and novel ceramic fibers. Major goals of his research include producing macro-assemblies made of nanostructures for applications, understanding growth mechanisms of nanostructures and designing new structures and multifunctional nanocomposites. Other research interests are phase stability in metal clusters, the graphite-diamond phase transition and growth of nanostructures under electron irradiation. He has expertise in different electron microscopy techniques.