

The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar



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Lecture Title: Synthesis of Carbon Nanocoils

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Abstract

Carbon coils with micron to nanometer scale have attracted much interest due to their potential applications such as nano-springs, nano-inductors, nano-magnetic source, electro-magnetic wave absorbers and micro-sensors. They were generally prepared by chemical vapor deposition (CVD) in ambient environment that had advantages of controllability, high quality and mass production. Carbon coils were occasionally found during the synthesis of carbon nanotubes, carbon fibers and the yield was low. This presentation reports the growth of carbon nano-coils (CNCs) with high yield on metal substrates, such as stainless steel, Au, and Ti plates, and Silicon and SiO₂ substrates. The effect of substrate on the growth behavior of CNCs is evaluated for controllability of CNC geometry. The synthesized CNCs have coil diameter of 100 nm – 1500 nm, line diameter of 20 nm – 350 nm, and pitch of 100 nm – 1300 nm. The tip growth of CNC was identified from the SEM, TEM and XRD results. The synthesis technique is scalable for mass production of CNC. Furthermore, growth of CNCs on electrically conducting substrates enables the direct integration of CNCs into electronic devices, solar cells, nano-magnetic source and micro-sensors.

Biography

Received BS in mechanical engineering from National Cheng Kung University, Taiwan, MS and Ph.D. in mechanical engineering from the University of Cincinnati. In 1984, he joined T. J. Watson Research Center, IBM Corp. in Yorktown Heights, NY where he worked on data printing, information storage and display technology. In 1990, he joined National Taiwan University (NTU) in Taiwan. Since then he was involved in several administration assignments, such as, the director of the Nano Electrical Mechanical (NEMS) Center, and the deputy director for Nano Science and Technology Center in NTU. He was a visiting scholar in the National Institute of Standards and Technology (NIST) and Stanford University in 2000 and 2003, respectively. From 2005 until now, on a joint assignment basis with NTU, he was invited to serve as the Deputy General Director, Mechanical and Systems Lab., Industrial Technology Research Institute (ITRI) in Hsinchu, Taiwan. His research interest involves in the electro-elasticity theory and application in ultra-precision machines, nanometer scale mechanics, carbon nanotubes and carbon nano-coils. He currently is the chair for IFToMM China-Taipei, and the chair for Nano-metrology and Characterization Technical Committee, IEEE Nanotechnology Council.

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