

Carbon Nanotubes/Polymer Nanocomposites: From Fundamental to Applications

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Abstract

With unique structure and transport properties, carbon nanotubes (CNTs) have attracted much interest as the reinforcement for polymer matrix composites. The CNT/polymer nanocomposites hold the promise of delivering exceptionally mechanical properties and multi-functional characteristics. The potential of employing CNTs as reinforcements has, however, been severely limited because of difficulties associated with the dispersion of entangled CNTs during processing and poor interfacial interactions between CNTs and polymers.

In light of our experience on CNTs, this seminar will offer a systematic presentation on the principles, theories and technical practices behind the dispersion of nanoparticles in general and process of CNT functionalization, as well as of the effects of CNT dispersion and functionalization on the resulted mechanical and functional properties of CNT/polymer nanocomposites. Three fundamental issues: i) Load transfer from polymer matrix to CNTs, ii) Evaluation on the dispersion quality of CNTs and behavior of dispersed CNTs during the nanocomposites fabrication, and iii) CNT foam with network structures for developing 3-dimensional polymer nanocomposites, will also be discussed. The application of CNT/polymer nanocomposites for engineering (Monitoring structural defects in fiber reinforced polymers) and environmental remediation (Oil-water separation) will be presented.

Short Biography

Professor Ma graduated with BSc in Chemistry and MSc in Polymer Chemistry and Physics, both from Lanzhou University, China. He obtained a PhD in Mechanical Engineering (Composites and Nanotechnology) from The Hong Kong University of Science and Technology (HKUST). He continued his research as a visiting scholar in the same institute for one and half years. From 2010 to 2012, he was supported by the Alexander von Humboldt Foundation (AvH), and working in Leibniz Institute of Polymer Research Dresden (IPFDD) in Germany. Professor Ma joined the Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Science (XJIPC-CAS) in May, 2012. Currently, he holds a Professorship under the 100-Talent Program of CAS.

Professor Ma has been active in carbon-based materials, polymer nanocomposites, interface science and characterization. Currently, his works focus on materials with hierarchical structures for engineering and environmental applications. He authored a monograph (Carbon Nanotubes for Polymer Reinforcement, CRC Press, 2011), 2 book chapters and published more than 40 papers, among which 8 papers were listed as

25-hottest articles. He was a holder of 10 patents, and 3 of them have been transferred to industry. Professor Ma's other research achievements include two Best Paper Awards from the 5th Asian-Australasian Conference on Composite Materials (ACCM-5) and the 9th International Symposium on Electronic Materials and Packaging (EMAP-2007), an Overseas Research Award to support him to carry out joint research in Korea Advanced Institute of Science and Technology (KAIST), Humboldt Research Fellowship, Outstanding Youth for Nature Science in Xinjiang Province, Excellent Research Award for the Western Light Program of CAS, High-level Human Resource in Xinjiang Province, and so on. He was an awardee of the National 1000-Talent Scheme (Recruitment Program of Global Expert, in Chinese: Qian-Ren-Ji-Hua). Thanks to his diligent effort and expertise in the field of composites science and technology, Professor Ma was awarded Composites Part A--Editor's Top Reviewer Award 2015. More recently, he was supported by the Danish University Alliance to pay an academic visit in Technical University of Denmark on a project "Polymer nanocomposites for wind blade materials".

