EFFECT OF SOLVENT AND CARBON NANOTUBE OXIDATION ON THE DYNAMIC EVOLUTION OF CARBON NANOTUBE IN LIQUIDS UNDER AC ELECTRIC FIELDS

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The exceptional properties of carbon nanotubes (CNTs) have triggered a lot of scientific and technological advances in the materials science research and novel applications. In the area of composite materials, the exceptional mechanical, thermal and electrical properties (among others) of the CNTs positioned them among the most used fillers as reinforcement, for improvement of effective properties. The area of CNT/polymer composites has been continuously growing and several nanocomposites have been explored for technological applications such as sensors, drug delivery systems and smart materials in the aerospace and vehicle systems, among many others. As a key requirement for the fabrication of these novel materials, the controlled manipulation of the CNTs in liquids becomes a relevant topic and many theoretical and experimental efforts have been carried out to understand such a complex phenomenon. The application of electric fields has demonstrated to be a convenient tool for this aim due its low cost, ease of application and control. The dielectrophoretic theory, initially used for biological cells, has been used to model the interaction of the CNTs immersed in solvents with applied electric fields. Here an experimental study on the dynamic evolution of CNTs in solvents under the application of AC electric fields is presented. The formation and evolution of the CNT network is assessed by the measurement of the electrical current through the system. RLC measurements during the electric field application are also carried out on the system. The influence of the electric field frequency, polarity of the solvent and oxidation of CNTs on the formation and evolution of the CNT interconnected networks are the main focus of the investigation. Understanding the response of CNT networks under electric fields represents an important step towards fabrication of novel tailored composites. This work was supported by CONACYT grants No. 235905 (AIOA) and No. 220513 (FA).

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