Special Feature: Organic Materials

Overview

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Organic materials exhibit a wide range of functionalities based on their mechanical, electrical, optical, thermal and biological properties. This is the result of the large number of chemical structures that can be formed using the carbon framework, including isomers, molecules with different steric configurations, and higher order structures such as crystals, liquid crystals and collective structures. Organic materials, especially polymeric materials, are also soft, light and easy to work, so they occupy an important position in industry.

As an introduction to a small part of the functionalities of organic materials, this special issue describes some of our recent research results, and includes two review articles and three original research articles. The first review article introduces a newly developed photoinduced immobilization method that uses a photoresponsive polymer, and describes its application as a medical diagnosis tool. The second review article focuses on the chemical stability of sensitized organic molecules and the durability of dye-sensitized solar cells using these molecules. Different degradation mechanisms are found under dark and light irradiation conditions. The first research article presents the results of recent atomistic and mesoscopic simulations of polymer materials based on dissipative particle dynamics. A novel method is also proposed for simulating evaporation processes by including an evaporation model and the effective mass in the dynamics. The second research article describes recently synthesized grafted carbon nanotubes (CNTs) using a surface-initiated polymerization technique, and their excellent electrical insulation properties. The third research article proposes a novel morphological control method for CNT/polymer composites with high thermal conductivity and strong electrical insulation properties. These conflicting properties were achieved by the localization of CNTs inside a polymer matrix.