Water: Thermodynamic and Dynamic Anomalies (abstract)

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Vibrational and Optical Properties of Single-Walled Carbon Nanotube-Semiconducting Polymers Composites (abstract)

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Carbon nanotubes have unique electronic properties that make them ideal for applications in nanoelectronics, particularly as fillers in polymer matrices to improve the properties of the composite materials. We present studies of the dispersion of HiPco carbon nanotubes in conjugated soluble polymers and the influence of their dispersion on the vibrational and optical properties of both the polymers and the carbon nanotubes. Different semiconducting polymer solutions such as poly(thiophene) and poly(p-phenylene vinylene) derivative were used for dispersing the carbon nanotube. Raman spectroscopy and scanning electron microscopy measurements were carried out to probe the morphology and the interaction between the different components of the nanocomposites. We show that the radial breathing modes of single-walled carbon nanotubes are influenced by the local environment created by solvents and polymers.

Water: Thermodynamic and Dynamic Anomalies (abstract)

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While the majority of fluids contract upon cooling, water expands when cooled below T = 4°C at atmospheric pressure. This effect is called density anomaly. Besides the density anomaly, there are more than 60 other anomalies known for water. Diffusivity is one of them. For normal liquids the diffusion coefficient decreases under compression. However, experimental results have shown that for water at temperatures below approximately 10°C, the diffusion coefficient increases under compression and has a maximum. The temperature of maximum density line, inside which the density anomaly occurs, and the line of maximum in diffusivity are located in the same region of the pressure-temperature phase diagram of water. We show how simulations for water also show thermodynamic and dynamic anomalies. These anomalies are then demonstrated to be related to two length scales effective potential.

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