Photoacoustic monitoring of the process of alignment in liquid dispersions of magnetized carbon nanotubes

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Liquid composites of carbon nanostructures are very promising due to their outstanding electrical, optical, and thermal properties. The physical properties of these materials can be reversibly manipulated inducing an order of the CNTs inside the matrix. This manipulation can be done by applying an external electric field, but it is induced heating ~~hating~~ due to the Joule effect. The magnetic field could be a good option; however, the intrinsic magnetic moment is not high enough to allow low-intensity magnetic fields to manipulate the nanotubes. One of the best options~~,~~ is to magnetize the nanotubes. In this paper, dispersions of magnetized multiwall carbon nanotubes at different concentrations in ethylene glycol and glycerol liquid matrices are presented. The response of the dispersions to the magnetic field was monitored as a function of time using the photoacoustic technique. To analyze the photoacoustic results, a theoretical model was developed based on the magnetic-field induced alignment of the carbon nanotubes in the matrix. Our results provide the evolution of the optical absorption coefficient as a function of time, concentration, and magnetic field.

Keywords Magnetic fluids, external magnetic field, decorated multiwalled carbon nanotubes, photoacoustic, optical absorption coefficient.

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