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Alignment of Carbon Nanotubes in Liquid Suspension by Electric Fields MATTHEW BROWN, JERRY W. SHAN, FRANK M. ZIMMERMANN, Rutgers University — We present a study of the electric-field-induced spatial alignment of single-wall carbon nanotubes (SWNTs) in ethanol suspension. Field-induced optical dichroism due to preferentially aligned nanotubes in the suspension affects the state of polarization of light passing through the sample. The change in polarization angle of a linearly polarized laser beam transmitted through the sample was used to measure the nematic order parameter characterizing the degree of alignment. Electric-field-induced alignment was measured for varying electric-field strengths, field frequencies, and temperatures of the sample. The observed alignment approached a steady-state value after a transient response on the order of seconds. The transient time scale is compared to that expected from viscous fluid dynamics. The dependence of the steady-state alignment on applied field strength and temperature is explained in terms of an equilibrium statistical mechanical model. The analysis allows us to determine the average electric polarizability of the nanotobes in the axial direction. The obtained polarizability is compared with theoretical values from the literature.

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