

Abstract Submitted
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Probing the orientation dynamics of multi-walled carbon nanotube composites via x-ray scattering methods SASWATI PUJARI, WESLEY BURGHARDT, Northwestern University — We have used in situ x-ray scattering methods to probe changes in orientation of multi-walled carbon nanotube (MWNT) composites in shear flow. These studies have been done using model nanocomposites prepared by dispersing MWNTs in Newtonian polymer matrix, to isolate effects of MWNT behavior from polymer elasticity. Structural measurements were made in a range of concentration in the flow-gradient (1-2) and flow-vorticity (1-3) planes of shear flow. The measurements revealed shear rate dependent MWNT orientation behavior; increased structural anisotropy with increasing shear rate. The degree of anisotropy was observed to decrease with particle concentration and aspect ratio. The induced anisotropy changed from being dominated by individual MWNT orientation in dilute suspensions to being dominated by deformations of MWNT networks in concentrated suspensions. A large, rapid loss of induced anisotropy was seen when flow was turned off due to dissipation of elastic energy stored in “sticky” MWNT contacts. These observations suggest that MWNT bending is central to the dynamic behavior of these suspensions under flow.

Wesley Burghardt
Northwestern University

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