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Flow induced orientation behavior of concentrated dispersions of multi-wall carbon nanotube suspensions under shear flow: Effect of aspect ratio and concentration SASWATI PUJARI, WESLEY BURGHARDT, Northwestern University, SAMEER RAHATEKAR, JEFFREY GILMAN, National Institute of Standards and Technology, KRZYSZTOF KOZIOL, ALAN WINDLE, Cambridge University — We report studies of average orientation state of concentrated dispersions of multi-walled carbon nanotube (MWNTs) in steady shear flow. Uncured epoxy was used as a viscous, Newtonian suspending medium, and samples were prepared from 'aligned' MWNTs using methods previously reported (Rahatekar et al., J Rheol 40:599, 2006). Flow induced structural measurements were made in the vorticity (1-3) plane of simple shear flow using in- situ wide angle x-ray scattering techniques in a rotating disc shear cell. Azimuthally-dependent diffraction from the internal layered structure of the MWNTs was used to characterize aligment. Steady state anisotropy of MWNT dispersions decrease with increasing the length of the MWNTs. Surprisingly, the anisotropy is seen to increase with increasing concentration. For one of the samples, more detailed orientation dynamics are studied in steady shear and transient shear flow both in the 1-2 (flow gradient) and 1-3 (vorticity) planes of shear flow, and through comparison of wide-angle and small-angle scattering signatures of flow-induced nanotube alignment.

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