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Unusual microscopic dynamics in melts of star-like polymer grafted nanoparticles and their binary mixtures JAYDEEP BASU, S. SRIVASTAVA, SIVASURENDER C, A. KANDAR, SARIKA C, Department of Physics, Indian Institute of Science, Bangalore 560 012. India, S. NARAYANAN, A. SANDY, Advanced Photon Source, Argonne National Laboratory, Argonne, IL 60439. USA
— Star polymers have attracted wide attention due to their fascinating structural, dynamical and rheological behavior including observation of multiple glassy states in concentrated solutions [1]. We have shown recently [2] that the microscopic dynamics in melts of a novel type of star-like polymers created by grafting of linear polymer chains on nanoparticle surfaces shows an unusual dynamical arrest in the case of low number,f, of grafted chains as opposed to that predicted and observed so far for both melts and solutions of star polymers. Here we extend our studies further to include similar star polymers with large range of f and their binary mixtures. Remarkably we find that the structural relaxation times of the star polymers becomes smaller with increasing arm number upto a certain value above which the relaxation time increases with f. Further, in binary mixtures of star polymers of two different sizes the relaxation time decreases dramatically with very low added small star fraction but shows dynamical arrest at significantly higher fraction of smaller stars. Reference: 1. C. Mayer et al Nature Materials 7, 780 (2008); 2. A. K. Kandar et al, J Chem Phys 130, 121102 (2009)

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