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Relaxation Dynamics of Nano Particles Embedded in a Soft Glassy Matrix JAYDEEP BASU, SUNITA SRIVASTAVA, AJOY KANDAR, Department of Physics, Indian Institute of Science, Bangalore, India, MRINMAY MUKHOPADHYAY, Department of Physics, UCSD, USA, LAURENCE LURIO, Department of Physics, NIU, USA, SUNIL SINHA, Department of Physics, UCSD, USA — Using x-ray photon correlation spectroscopy, we have studied slow, wave vector and temperature dependent microrheology of nano particles embedded in glassy matrix with unique viscoelastic properties. The measurements were done for a polymer matrix (PMMA) using gold nanoparticles as probe. The intensity autocorrelation function exhibits a cross-over from compressed to stretched relaxation behavior on cooling from above the glass transition temperature (T_g) of PMMA. Although stretched exponential relaxation is expected in the glassy state one would expect simple exponential relaxation above the T_g. We also find that the relaxation time (τ), follows $\tau \sim q^{-1}$ dependence indicating super-diffusive motion of nanoparticles. Interestingly, we have also observed subtle effects like length scale dependence of the stretching exponent. This points to the importance of the nanoparticles in modifying the viscoelastic property of the polymer matrix and highlights the strength of this technique in extracting their micro-rheological properties.

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