

Nanoscale Studies of Glassy Dynamics

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The ability to probe the *local* or nanoscale dynamics in glassy materials makes it possible to directly study finite size effects and effects of intrinsic length scales set by e.g. dynamical heterogeneity. Two new techniques for probing local glassy dynamics in polymer glasses will be discussed. The first involves local dielectric spectroscopy, and involves the use of non-contact scanning probe microscopy (SPM). It was used to probe the near-surface glassy dynamics of PVAc, where some differences from bulk behaviour were observed including slight shifts in T_g and an increase in fragility. The second technique involves probing local spontaneous thermal fluctuations of electric polarization, again using an SPM approach. By this means, fluctuation images and spatio-temporal correlation functions can be studied. When the two techniques are compared, we find that they provide a means of testing the local fluctuation-dissipation-relation (FDR), which we have studied in bulk aging glassy polymers.