236e Composition Dependence of the Dynamics of Poly(Methyl Methacrylate) in Binary Blends with Poly(Ethylene Oxide)

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We investigate the composition dependence of segmental dynamics of poly(methyl methacrylate) [PMMA] in miscible binary blends with poly(ethylene oxide) [PEO] using quasi-elastic neutron scattering (QENS) in combination with deuterium labeling. QENS provides angstrom to nanometer spatial resolution on timescales covering picoseconds to nanoseconds. Blends containg 10, 20 and 30wt% PEO are considered. At a given temperature, the mobility of PMMA decreases as the composition of PEO increases. In all cases, PMMA segmental mobility is controlled by the distance above the glass transition temperature (Tg), suggesting that local compositions rich in PMMA are not a significant factor in this system. This is confirmed using atomistic molecular dynamics simulations where effective compositions may be directly calculated. Within the temperature range observable with QENS, the relaxation times generally follow Arrhenius behavior, with the exception of low momentum transfer. Moreover, the Arrhenius activation energy, consistent with that obtained in dielectric spectroscopy for the merged alpha/beta-process, is independent of composition.