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Elevated single polymer surface diffusion on a film near its glass transition temperature MARK GEOGHEGAN, MATTHEW MEARS, CHRISTOPHER CLARKSON, ZHENYU ZHANG, University of Sheffield, JOHN TORKELSON, Northwestern University — Fluorescence correlation spectroscopy data are presented to show that the diffusion coefficient of poly(ethylene oxide) (PEO) adsorbed onto poly(alkyl methacrylate) (PAMA) and polystyrene films in aqueous solution increases close to (but below) the surface glass transition temperature of the film. This increase disappeared at higher temperatures as the film liquified, although the diffusion coefficient for the PEO on the polystyrene surface remained greater than the diffusion coefficients for PEO on the PAMA films at temperatures greater than those at which the peak in diffusion occurred. A similar increase was found in the surface tension of all films studied. Experiments on (immiscible) blends of two PAMA homopolymers were performed where two peaks in the diffusion coefficient were observed with increasing temperature. Two peaks were also observed in the surface tension from contact angle experiments, although at temperatures slightly greater than those at which the peak in diffusion was observed. It is concluded that the enhanced surface mobility of the films near the surface glass transition temperature induces conformational changes in the adsorbed PEO molecules resulting in elevated diffusion coefficients.

Mark Geoghegan
University of Sheffield

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