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Tuning the Miscibility of Polystyrene / Poly(vinyl methyl ether) Blends with Electric Fields ANNIKA KRIISA, CONNIE ROTH, Department of Physics, Emory University, Atlanta, GA USA — Application of electric fields seem experimentally simple, as they can be switched on and off instantly and effortlessly. Nevertheless the influence of electric fields on the phase separation temperature Ts in small molecules and polymeric mixtures is not yet well understood. Available theoretical calculations use thermodynamic arguments for adding an electrostatic free energy term to the total free energy of mixing and predict changes in Ts due to external electric fields that are much smaller than what most experimental results report. To date, neither theory or experiments have found a clear consensus on whether uniform electric fields enhance mixing or demixing. As only a few experimental results have been published over the past several decades with typically only small shifts in Ts, more experiments with unambiguously large shifts in Ts are needed to better understand this effect. Using a fluorescence technique we have developed for measuring the phase separation temperature Ts of polystyrene (PS) / poly(vinyl methyl ether) (PVME) blends [J. Polym. Sci., Part B 2012, 50, 250-256], we investigate the change in Ts due to the presence of electric fields. We show that electric fields strongly enhance mixing in PS/PVME polymer blends. For example, for a 50/50 PS/PVME blend composition, Ts is increased by over 10 K for electric fields of 18 kV/mm.

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