

# A light scattering investigation of a sol-gel/melt transition: the poly(ethylene oxide) (PEO)/methanol/LiClO<sub>4</sub> system<sup>\*</sup>

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The structure and dynamics of 50K PEO methanol solutions and PEO melts, with and without LiClO<sub>4</sub>, were studied using static light scattering (SLS) and photon correlation spectroscopy (PCS). Scattering light intensity autocorrelation functions revealed that with increasing PEO concentration, fast PEO concentration fluctuation relaxations gradually disappeared even as slow mode relaxations emerged. The fast relaxation was diffusive, exhibiting  $q^2$  dependence. Associated dynamic screening lengths,  $\xi_h$ , scaled as the -0.73 power of polymer concentration, as expected, in the semidilute solution regime. Significantly, the slow mode relaxation was also diffusive, both in solution and in PEO melts, behavior interpreted in both cases as due to the relaxation of a transient PEO network. Static measurements revealed power law behavior in PEO melts,  $I(q) \sim q^{-2.0}$  in agreement with percolation theory despite the absence of an abrupt sol-gel transition. Moreover, for a given polymer concentration, the degree of PEO chain entanglement varied depending on the salt concentration.

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