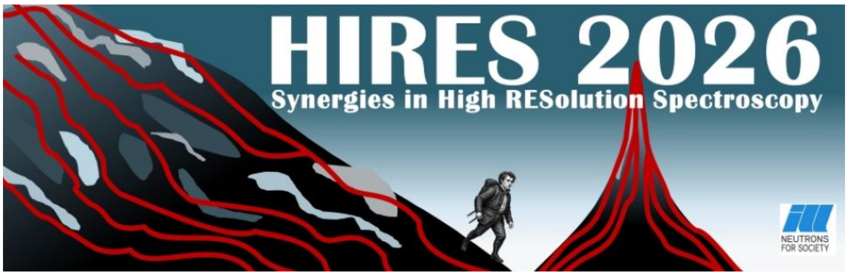

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Dynamics of Polymer Rings in Ring-Linear Blends combining Rheology and Neutron Spin Echo Spectroscopy

We have investigated the dynamics of polyethylene-oxide (PEO) ring/linear blends of various molecular weight ratios. Both the blend viscosity as well as the microscopic dynamics were studied. The blend viscosity displays a maximum at intermediate ring volume fractions. For symmetric blends the relative viscosity maximum increases with the molecular weight of the polymers, while for asymmetric blends the viscosity maximum gets stronger, if the linear constituent becomes smaller than the ring. Applying neutron spin echo (NSE) spectroscopy on samples containing a fraction of labelled rings, we essentially observed the internal ring dynamics and its modifications as function of ring volume fraction ϕ_R. We observe an increased enslavement of the ring dynamics with higher host Mw. While this holds for all hosts above 10K, linear chains exhibiting only five entanglements are not able to impress its dynamics on the rings. In symmetric ring linear blends increasing ring enslavement well correlates with the increase of the viscosity enhancement observed. For asymmetric blends increasing host Mw in all cases leads to stronger enslavement. The observed increase of the viscosity found for shorter hosts does not find any parallel in the microscopic dynamics. Blends. At ϕ_R=0.5 the spectral shapes are still local reptation type, however, the decrease of constraints compared to the neat linear melts is more pronounced for the shorter host. The results qualitatively agree with available simulations validating them.

Session

Soft Condensed Matter

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