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Associating behavior of one polyimide with high molecular weight in solution through a relatively weak interaction

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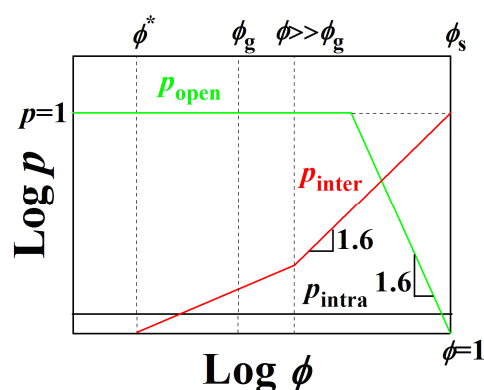
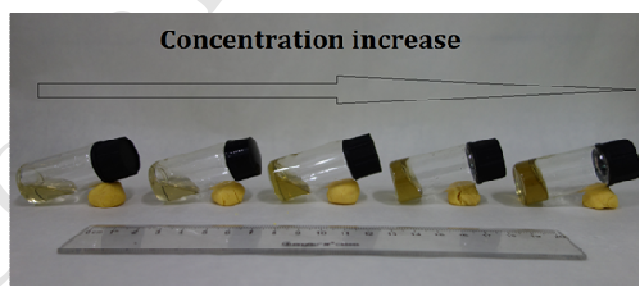
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GRAPHICAL ABSTRACT

One soluble polyimide with high molecular weight was synthesized and its scaling relationship between $\eta_0 - \eta_s$ and concentration was studied. It was found that the scaling relationship fits the theory of associating polymer. Based on oscillation frequency experiment, UV-Visible spectra and synchrotron radiation small-angle X-ray scattering (SAXS) of concentrated polyimide solutions, it demonstrated the appearance of interaction between polyimide segments. Finally, combined with the quantum chemical calculation, one model based on relatively weak interaction (i.e., dipole-dipole and π - π interactions) from chemical units of polyimides is proposed to explain the associating behavior of high molecular weight polyimide in solution and the shear thinning phenomenon. The sticky Rouse model and sticky reptation model are corrected to fit the results of our PI sample. This polyimide is definitely one novel kind of associating polymer and different from strong interaction system.



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