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Simultaneous determination of the interaction parameter and topological scaling features of polymers in dilute solutions DURGESH RAI, GREGORY BEAUCAGE, University of Cincinnati, RATKANTHWAR KEDAR, NIKOS HADJICHRISTIDIS, University of Athens, HONG KUNLUN, DAVID UHRIG, Oak Ridge National Laboratory, ANDY TSOU, ExxonMobil Research & Engineering Company — The RPA equation using the Debye polymer chain scattering function has been widely used to model polymer blends of linear chains in the melt where it is safe to assume a Gaussian conformation. When chains display more complicated topologies or when chains are in dilute solution Gaussian scaling no longer applies. In some cases the Zimm double extrapolation has been used to determine the second virial coefficient and the interaction parameter under the assumption that the deviation of chain scaling from a random walk is acceptable in the low qRg region such as when light scattering is used. If it is of interest to explicitly determine the nature of chain scaling, related to topology or solvent quality, as well as to quantify the thermodynamic interaction, such as in studies of cyclic and branched chains, networks, or polymers in good solvents, there is no analytically valid scattering model for data analysis. We propose the coupling of the unified scattering function with the RPA equation to analytically model these effects. Nevertheless, some issues remain to be resolved with star polymers in particular, such as scattering from highly branched high molecular weight symmetric stars in good solvents where it appears that the Daoud-Cotton model may be appropriate but a colloidal scattering model may be more appropriate.

Durgesh Rai
University of Cincinnati

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