

# Nonuniversal features in polymer dynamics

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## ABSTRACT:

Viscoelastic properties of homogeneous polymeric liquids have been one of the central research subjects in polymer physics. Extensive experiments in the early days established that the properties related to terminal relaxation are determined by just a few molecular parameters irrespective of the chemical structure and concentration of the polymers. In this sense, those properties have been believed to possess a universal character in both linear and nonlinear regimes.

Nevertheless, a serious breakdown of the universality was experimentally found in the steady-state elongation viscosity of the simplest systems, melt and semidilute solution of entangled linear polystyrene (PS) with narrow MWD. Extensive studies have examined the molecular origin(s) of the lack of universality from both experimental and theoretical points of view. Some of those studies consider that reducing the friction coefficient  $\zeta$  of monomeric segments in an oriented/stretched environment is the crucial factor leading to the difference between the solutions and melts of various chemical structures.

The breakdown of universality was also found in the linear viscoelastic regime of the entangled linear chains; the difference in the constraint release (CR) times of PS and polyisoprene (PI) was experimentally pointed out, but its molecular origin remains unclear.

In this talk, we will review the non-universality of polymer dynamics found in linear and nonlinear viscoelastic regimes, introduce our recent studies on these subjects, and further discuss room for the chemical structure of polymers (and solvents) to play a substantial role in polymer rheology.

## references

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