mBSW Model Data for the Rheology Textbook

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Introduction

This Jupyter Notebook (mBSW_data_generation.ipynb) computes the relaxation modulus and dynamic moduli from a given set of mBSW parameters and saves it to .csv files in the output_data/ folder.

Summary

- Data used here from the Hatzikiriakos et al. (2000) is for "PB-linear", a well-entangled linear 1,4 polybutadiene:

  Hatzikiriakos, Savvas & Kapnistos, Michael & Chevillard, Cyril & Winter, H. & Roovers, Jacques. (2000). Relaxation time spectra of star polymers. Rheologica Acta. 39. 38-43. 10.1007/s003970050005

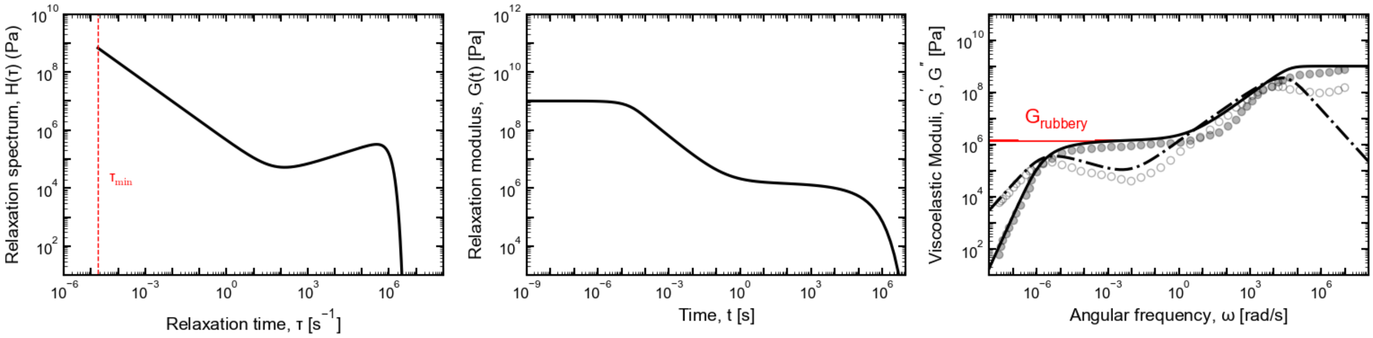
- The inferred parameters from the paper corresponding to our standard mBSW form are:

$$H(\tau) = e^{-\left(\frac{\tau}{\tau_{\max}}\right)^{\beta}} \left[H_e \left(\frac{\tau}{\tau_{\max}}\right)^{n_e} + H_g \left(\frac{\tau}{\tau_e}\right)^{-n_g} \right]$$

Variable	**Value**
H_g (Pa)	4.9×10^5
n_g	0.67
τ_e (s)	0.86
H_e (Pa)	1.86×10^5
n_e	0.30
$\tau_{\max}$ (s)	9.0×10^5
β	2.0

- A free parameter not mentioned is the minimum cutoff relaxation time ($\tau_{\min}$). We used it to match the glassy modulus, giving us:
  - $\tau_{\min} = 1.8 \times 10^{-5}$ s
  - Calculated rubbery modulus, $G_{\text{rubbery}} = 1.42$ MPa

  Additional analysis performed for improved model fitting and uncertainty quantification. Details in additional_analysis/.



Contributing

Feel free to modify the notebook for different datasets or additional processing steps. Please contact asm[eighteen][at]illinois.edu for any feedback.

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