Experiments Data
Summary

1. Shear Stress Flow

A. Linear polymers

\[ \psi \approx -\frac{1}{10} \psi \] (the effect of shear rate)
B. Effect of MW

- Increasing MW

\[ \log \eta \]

- Strong
  - Linear in \( \eta \)
  - MW at low rates
  - MW at high rates becomes independent of MW

\[ (\text{MW} = \text{mol} \cdot \text{wt.}) \]
There are different $M_c$'s for different polymers. For entanglement, $M_c$ = critical molecular weight.
C. Effect of Molecular Weight Distribution

\[ \log \eta \]

\[ \text{broad MWD} \]

\[ \text{narrow MWD} \]

D. Branching
- Slows down relaxation
- Has complex effect on \( \eta \)
E. Effect of filler

\[ \log \eta \] \quad \text{no increases with increasing filler concentration} \quad \log \eta

F. Temperature effect:

it's an important effect
2. Time Dependent
   
   A. Startup
   \[ \log \eta^+ \] \[
   \log t \quad \text{increasing } \psi^+ \]

   B. Cessation
   \[ \log \eta^- \] \[
   \log t \quad \text{decreasing } \psi^- \]
c. SAOS (G', G'')

- log G', G''
- G''
- G'
- terminal zone
- log W
- rubbery zone
- glassy zone
- entanglement plateau
- $10^9$ Pa
- $10^4$ - $10^5$ Pa

breadth of plateau increases with MW
\[ \text{Cox-Mroz Rule} \]

\[ \text{C}_x = 0.05 \text{ unit} \]

\[ 27 \text{ m/s} \]

\[ x = 3 \text{ m} \]

\[ \frac{v}{g} \]

\[ s_{100} \]

\[ \theta \]

\[ \text{form} \]

\[ \triangle y = \frac{7 \text{ in}}{5/2} \]
3. Strain Dependence

A. Skip Strain Exp

\[ \log G(t, \delta_0) = \delta_0 = \text{strain} \]

If we shift high \( \delta \) curves up we get a master curve

\[ \log (G(t, \delta_{\text{shifted}})) \]

\[ \log t \]

\[ \log \delta_0 \]
1. Elongational Data

- Zero shear elongation
- Make zero shear elongation in SAOE
- Strain dependence + dependence separable

\[ \eta_0 = 370 \]

Traction's Law