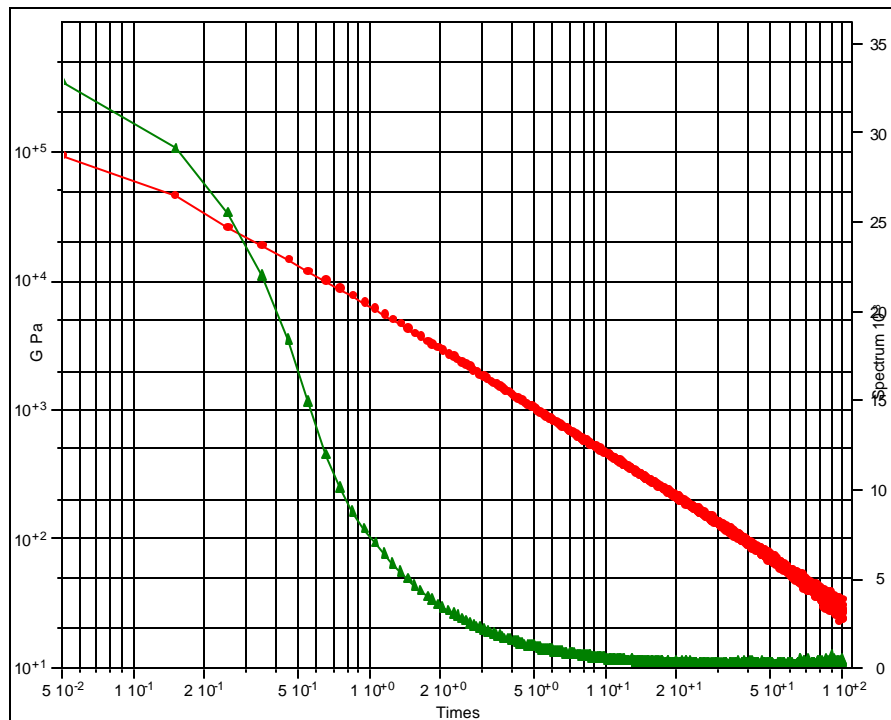


Stress Relaxation of a Polymer Melt

One of the quickest means to determine the relaxation behavior of a polymer is to perform a step increase in strain and monitor the relaxation of the sample. Relaxation data relate directly to important process parameters such as the cycle time in injection molding. In the figure below, a high molecular weight sample of polydimethylsiloxane is subjected to a step change in strain of 20% using a 25mm parallel plate and gap of 1.00 mm. The step occurs in 0.05 seconds. Note that data are obtained continuously across 4 decades in stress. The sample was loaded using the patented Stresstech normal force control, limiting the maximum normal stress to 40kPa to ensure that the sample does not experience excessive shearing during loading. Samples that undergo significant deformation during loading or prior to testing may experience a reduction in the number of entanglements which may affect the measured data.

Note that the rheometer automatically calculates the relaxation spectrum (green triangles) from the relaxation modulus (red circles) facilitating data analysis. For samples that are weakly elastic, it may be useful to program a specific rise time to avoid sample resonance in the relaxation data. RheoExplorer software enables the user to specify the strain rise to accommodate a wide range of samples. The relaxation data can be acquired in log or linear fashion.

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