Detecting Molecular Weight Distribution from Viscoelastic Measurements and Relation by Melt Calibration

Tommi Borg
TomCoat Oy, Koskisenkuja 11, 62500 Evijärvi, Finland

Esko J. Pääkkönen
Perlos Oyj, R&D Center, P.O. Box 100, 33471 Ylöjärvi, Finland

A constitutive model for the linear viscoelasticity of polymers is presented for the relation between the relaxation modulus and the molecular weight distribution (MWD). We also compute the MWD from a viscosity and relaxation modulus curves, in which all variables are kept on the original measurement scale before final conversion to the output scales by *melt calibration*; that is, the relation between time scale and the molecular weight. This procedure has similarities with the widely used universal calibration. Starting from viscoelastic measurements, the new model is used to determine the MWD, relaxation moduli, and the relaxation spectra of polyethylene of different grades. In addition, two benchmark analyses of bimodal polystyrene are reported. Moreover, for a constant MWD, application of the method to melt calibration allows interconversions between rheological functions that depend on frequency, shear rate, and time, and also a general Cox–Merz rule can be proved.