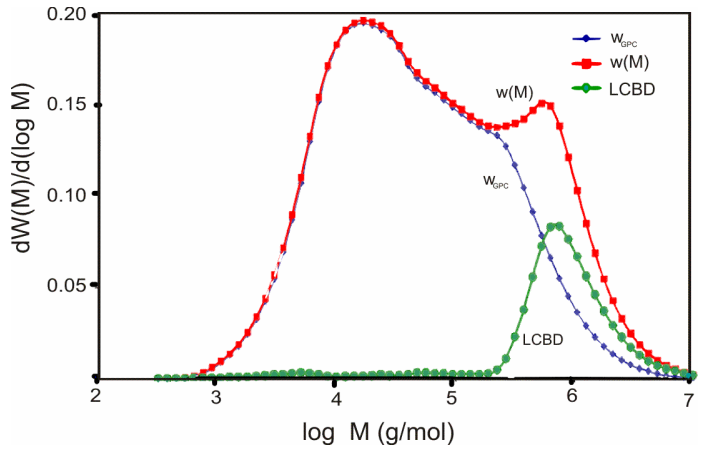
Long chain branching and molecular weight distribution characterization by the new rheological model.

Tommi Borg[1], Esko J. Pääkkönen[2]

[1]TomCoat Oy (Finland)
[2]Tampere University of Technology (Finland)

New findings of polymer structure, relations with viscoelastic flows and measurement routines are presented based on Control Theory used for polyolefin melts. At first the wide subject is discussed briefly. In our published papers the new model introduces over 60 novel formulas for different types of polymer flows. The model starts from the dimensions of a statistical tube of the single molecule chain, which conducts to the formulas according to Control Theory. The final mathematical formula is the homogeneous differential equation, where so-called RED (Rheological Effective Distribution) is the fingerprint of the behaviours of polymer. This function has similarities with the elugram or elution curve used in chromatography analyses. The RED is related and can be converted to many viscoelastic flow functions as relaxation modulus and spectra,1 dynamic moduli2 and shear viscosity3, transition viscosity, start-up4 and elongation viscosity5. Furthermore, by melt calibration, which has again similarities with the procedures used in chromatography analyses, RED is converted to the MWD. Finally, new case studies are presented and is discussed the effect of LCBs and MWDs to the viscoelastic properties. Free and commercial RheoPower software package versions were developed using the above principle.



MWDs and LCBD obtained from REDs by melt calibration for HDPE. Simulations of GPC/SEC measurements are indicated by wGPC (blue line). The complete RED was converted into MWD w(M) (red line), which shows the second peak relating to LCB. The LCBD or wLCB(M) was obtained from the difference w(M) – wGPC(M).

References:

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