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Precision Polymer Processing Experiments and their Matching with Numerical Simulation

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This paper reviews the development of a "Multipass Rheometer" that is capable of producing a range of well defined processing flows using small quantities of polymer and very well defined boundary conditions. The apparatus can probe a range of experimental conditions where flow, temperature and pressure are fully specified. Pressure difference measurements provide a rheological process response and optical and flow birefringence observations can reveal powerful information on stress distributions within flowing polymer systems. In some cases it is also possible to match experimental time dependant complex flow data with numerical simulation and thereby test the validity of the assumptions used in the modelling.