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Rheology of Polymers* in Micro Situation

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Recently, with the huge development of Microsystems (or MEMS, Lab-on-chip, etc…), polymers are looking like the favourite materials for replication of micro and nano structures within different types of forming processes such as micro injection, micro extrusion, hot embossing, direct micro and nano writing, etc…
Hence, usually modelled at the molecular scale nowadays - by a Doi-Edwards type of model - the mechanical behaviour of the polymer melts (as used in all the above applications) is usually characterized at the macro scale with conventional rheometrical instruments.. However, in most of the micro structure applications, the scale of interest is the mesoscale, say between 1 mm and 100 nm.
In the following work, tools and techniques are developed in order to analyze the behaviour of polymer melts* at the mesoscale. A comparison with the macroscale behaviour is done to trigger the pertinent parameters in the mesoscale behaviour of these fluids *.
(*The polymer melts studied here are different grades specially developed for the micro injection process)