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Nuclear Magnetic Resonance a Versatile tool for the Investigation of Polymer Melts

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Nuclear magnetic resonance (NMR) is a versatile tool for the investigation of soft matter providing information on molecular structure order and mobility. In addition the application of space-dependent magnetic fields permits the acquisition of spatially resolved NMR information.

The application to poly melts in a model system and for process monitoring in extrusion will be shown. In the model system in a high-field magnet high resolution of spatial and spectral information is achieved. In a polymer melt under shear the location of solid filler is detected. In an integral measurement changes in molecular order and relaxation are measured. The introduction of an additional dimension permits the measurement of flow. For each pixel the flow velocity is determined in magnitude and direction, from which a complex flow pattern is derived. Using a surface NMR device NMR relaxation time measurements have been performed on a dye at an extruder, demonstrating the feasibility of inline NMR at high temperatures.