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NMR Velocimetry and Spectroscopy at Microscopic Resolution in Small Rheometric Devices

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Abstract. We describe several different rheometric devices for use within the nuclear-magnetic-resonance probe of a standard widebore microimaging system. These include both vertical and horizontal Couette cells and the cone-and-plate cell, which produce shearing flows, and the four-roll mill and the opposed-jet (cross-flow junction) cells which produce extensional flow. We demonstrate that velocity images can be obtained for each and that detailed information about local shear and extension rates can be extracted. These systems have considerable potential for use in the study of non-Newtonian viscosity, and of molecular ordering under shear or extension.