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(G*) (POS-18) Dynamic Mechanical Analysis with Portable NMR

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Dynamic mechanical analysis (DMA) is an umbrella term for a variety of rheological experiments in which the response of a sample subjected to an oscillatory force is measured to characterize its dynamic properties. In this work, we present a method for DMA that employs simple magnetic resonance techniques and a small unilateral three magnet array with an extended constant gradient to measure the velocity of a vibrating sample. By orienting the vibrations in the direction of the gradient, we use the motion-sensitized phase accumulation to determine the velocity. By implementing delays into the pulse sequence, we measure the phase at evenly spaced points in the vibration cycle, allowing for the acquisition of a complete velocity waveform. Using velocity waveforms, samples are characterized through differences in amplitude and phase, providing information on the magnitude of the dynamic modulus and loss-angle, respectively.

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