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Probing the Mullins Effect in Filled Elastomers by Small Angle X-ray and Neutron Scattering ARTHUR SCHOLZ, Materials Department, UCSB, REX HJELM, MARK TAYLOR, Los Alamos Neutron Science Center, ED KRAMER, Materials Department, UCSB — While there has been considerable effort made to understand and model the effect that filler particles have on the mechanical properties of filled elastomers, the origins of a striking characteristic strain softening known as the Mullins Effect are still debated. Several micro-mechanical models have been proposed using a variety of mechanisms to describe the polymer-filler and filler-filler interactions to fit mechanical test data without any direct observation of microstructural changes. Small angle x-ray and neutron scattering provide complimentary methods for observing these changes on the relevant length and time scales necessary for identifying and characterizing the proposed mechanisms. We designed and built a modular uniaxial load frame for use in a variety of lab and user facilities. Its capabilities include a 350mm of symmetrical travel and a non-contact strain measurement system using speckle pattern digital image correlation. The system was developed and tested on silica-filled polydimethylsiloxane (PDMS) and polyphenylmethylsiloxane (PPMS) elastomers using the Low Q Diffractometer at the Los Alamos Neutron Science Center at Los Alamos National Laboratory.

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