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The Measurement of Surface Rheological and Surface Adhesive Properties of a PDMS Rubber using Micro- and Nano-Particle Embedment STEPHEN HUTCHESON, GREGORY MCKENNA, Texas Tech University — In previous work, we used particle embedment data to determine the rheological response of the surfaces of a polystyrene film, a phase separated copolymer and a commercially available polydimethylsiloxane (PDMS) rubber through the application of a viscoelastic contact mechanics model. The goal of the current research is to build off this analysis and use micro- and nano-sphere embedment experiments to probe the surface rheological behavior of PDMS in the rubbery state. The work includes measurements made with different particle diameters and chemistries. An atomic force microscope (AFM) is used to measure the embedment depth as nanoparticles are pulled into the surface by the thermodynamic work of adhesion. Present results show that silica probes of different sizes (500 nm and 300 nm) give different results for the surface adhesion properties and the surface rheological properties determined from the particle embedment data and at scales much larger than the nanometer size scale where one might expect such deviations. Possible water entrapment and effects of particle surface composition on the results will be discussed.

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