Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

How does the molecular network structure influence PDMS elastomer wettability? MATTHEW MELILLO, JAN GENZER, North Carolina State University — Poly(dimethylsiloxane) (PDMS) is one of the most common elastomers, with applications ranging from medical devices to absorbents for water treatment. Fundamental understanding of how liquids spread on the surface of and absorb into PDMS networks is of critical importance for the design and use of another application - microfluidic devices. We have systematically studied the effects of polymer molecular weight, loading of tetra-functional crosslinker, end-group chemical functionality, and the extent of dilution of the curing mixture on the mechanical and surface properties of end-linked PDMS networks. The gel and sol fractions, storage and loss moduli, liquid swelling ratios, and water contact angles have all been shown to vary greatly based on the aforementioned variables. Similar trends were observed for the commercial PDMS material, Sylgard-184. Our results have confirmed theories predicting the relationships between modulus and swelling. Furthermore, we have provided new evidence for the strong influence that substrate modulus and molecular network structure have on the wettability of PDMS elastomers. These findings will aid in the design and implementation of efficient microfluidics and other PDMS-based materials that involve the transport of liquids.

Matthew Melillo
North Carolina State University

Date submitted: 03 Nov 2015 Electronic form version 1.4