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Preparation Details for Making Silicones: Influence of Molecular Network Architecture on Mechanical and Surface Properties of PDMS Elastomers MATTHEW MELILLO, EDWIN WALKER, ZOE KLEIN, KIRILL EFIMENKO, JAN GENZER, North Carolina State Univ — 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, the extent of dilution of the curing mixture, and gelation kinetics 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 and we've also applied the theory of Macosko-Miller to estimate extent of reaction of crosslinker and polymer groups. Methods for determining the molecular weight between crosslinks from swelling, mechanical, and gelation theories were applied to ascertain their similarities and differences in an effort to identify the most accurate method. These findings will aid in the design and implementation of efficient microfluidics and other PDMS-based materials that involve the transport of liquids.

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