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Systematic Investigation of the Mechanical and Surface Properties of Poly(dimethylsiloxane) Networks MATTHEW MELILLO, ZOE KLEIN, EDWIN WALKER, JAN GENZER, North Carolina State Univ — Poly(dimethylsiloxane) (PDMS) is one of the most common elastomers. Its applications range broadly from medical devices to absorbents for water treatment, and recently it has seen rapid growth in the use of microfluidic devices. Despite extensive research and characterization of PDMS networks, the static water contact angles of these elastomers reported in the literature range broadly from a low near 90 degrees upwards to greater than 120 degrees. To investigate this large gap in reported surface properties, we have systematically studied the effects of polymer molecular weight, degree of tetra-functional crosslinker loading, 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, mechanical properties, and water contact angles have been shown to vary greatly based on the aforementioned variables. This study provides insight to the factors that contribute to such a wide range of surface properties reported in the literature. Furthermore, these results demonstrate the need to fully and carefully consider the manner and environment in which PDMS networks are formed when preparing them for specific applications.

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