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Influence of Bulk PDMS Network Properties on Water Wettability 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 sealants and marine antifouling coatings 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 – medical devices. We have systematically studied the effects of polymer molecular weight, loading of tetra-functional crosslinker, and end-group chemical functionality on the mechanical and surface properties of end-linked PDMS networks. Wettability was investigated through the sessile drop technique, wherein a DI water droplet was placed on the bulk network surface and droplet volume, shape, surface area, and contact angle were monitored as a function of time. Various silicone substrates ranging from incredibly soft and flexible materials (E' ˜50 kPa) to highly rigid networks (E' ˜5 MPa) were tested. The dynamic behavior of the droplet on the surfaces demonstrated equilibration times between the droplet and surface on the order of ˜5 minutes. Similar trends were observed for the commercial PDMS material, Sylgard-184. Our results 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, accurate, and safe PDMS-based medical devices and microfluidic materials that involve aqueous media.

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