

Abstract Submitted
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Direct measurement of surface stress of stretched soft solids. QIN XU, ERIC DUFRESNE, Mechanical Engineering and Materials Science, Yale University — The wetting profile of liquid droplets on soft solids is determined by the competition between elasticity and solid surface stress. Near the contact point, the bulk elasticity becomes negligible such that Neumann’s classic analysis nicely captures the wetting geometry and provides us an effective approach to directly measure the solid surface stress. Here, we report our experiments using confocal microscopy in studying the wetting of liquids on soft PDMS gels. While the droplets are sitting on the top, the substrates are biaxially strained. We observe that the wetting profiles and the three-phase contact angles are changing dramatically as the substrate is stretched. With Neumann’s principle, we obtain the quantitative relation between surface stress of the PDMS and the applied strain. These results suggest a significant strain-dependence of surface energy and surface stress for our PDMS.

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