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Droplet Spreading with Sol-Gel Transition MAZIYAR JALAAL, BORIS STOEBER, Department of Mechanical Engineering, The University of British Columbia, Vancouver, BC, Canada, NEIL J. BALMFORTH, Department of Mathematics, The University of British Columbia, Vancouver, BC, Canada —
The impact and spreading of liquid droplets on a smooth solid substrate is a classical subject with several industrial applications such as ink-jet printing, spray cooling, coating, and many others. For many of these deposition processes, controlling the final shape of the drop is critical. In the current research, a new technique for controlling the spreading of droplets impacting a substrate is presented. This technique exploits the rheology of a thermo-responsive polymer solution that undergoes a reversible sol/gel transition above a critical temperature. Experiments are conducted using a combination of shadowgraphy and micro-PIV to observe spreading drops. It is shown that the final diameter of a droplet can be controlled through the temperature of the substrate and the tunable sol/gel transition temperature of the fluid.A mathematical model is provided to further elucidate the flow dynamics.

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