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Self-crumpling elastomers: bending motion induced by a drying stimulus[1] FRANÇOIS BOULOGNE, HOWARD A. STONE, Princeton University, Complex Fluid Group — Capillary forces exerted by a liquid drop can bend elastic slender structures such as fibers or sheets. However, to successfully achieve capillary origami with sheets, it is important to make sure that the adhesion of the elastomer with the surface is low. We report an experimental study of the drying-induced peeling of a bilayer consisting of an elastomeric disk coated with a suspension of nanoparticles. We show that where capillary forces associated with the scale of the droplet can not compete with the adhesion of the elastomer on a surface, nevertheless large tensile stress developed in the coating, which resulted in a moment bending the bilayer. We attribute this stress to the nano-menisci in the pores of the colloidal material and we propose a model that describes successfully the early stage curvature of the bilayer. Thus, we show that the peeling can be conveniently controlled by the particle size and the coating thickness. We believe that such systems can be employed in various situations where delicate surfaces are involved such as in applications with optical and electronic components or in restoration of photographies, painting, wallpaper, fragile collectibles from contamination by dust, pollen, dirt, etc.

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