

Abstract Submitted
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Deformation of an asymmetric film¹ JUN GENG, JONATHAN SELINGER, Liquid Crystal Institute, Kent State University — Recent experiments have investigated shape changes of polymer films induced by asymmetric swelling by a chemical vapor. Inspired by recent work on the shaping of elastic sheets by non-Euclidean metrics [1,2], we represent the effect of chemical vapors by a change in the target metric tensor. In this problem, unlike Refs. [1,2], the target metric is asymmetric between the two sides of the film. Changing this metric induces a curvature of the film, which may be Gaussian curvature into a sphere or mean curvature into a cylinder. We calculate the elastic energy for each of these shapes, and show that the sphere is favored for films smaller than a critical size, which depends on the film thickness, while the cylinder is favored for larger films. We compare the formalism for asymmetric films with previous theoretical work on symmetric films, and compare the predictions with experimental results.

[1] Y. Klein, E. Efrati, and E. Sharon, *Science* 315, 1116 (2007).

[2] E. Efrati, E. Sharon, and R. Kupferman, *J. Mech. Phys. Solids* 57, 762 (2009).

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