MAR16-2015-006731

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Control of defect localization in crystalline wrinkling by curvature and topology[1]

FRANCISCO LOPEZ JIMENEZ, MIT

We investigate the influence of curvature and topology on crystalline wrinkling patterns in generic elastic bilayers. Our numerical analysis predicts that the total number of defects created by adiabatic compression exhibits universal quadratic scaling for spherical, ellipsoidal and toroidal surfaces over a wide range of system sizes. However, both the localization of individual defects and the orientation of defect chains depend strongly on the local Gaussian curvature and its gradients across a surface. Our results imply that curvature and topology can be utilized to pattern defects in elastic materials, thus promising improved control over hierarchical bending, buckling or folding processes. Generally, this study suggests that bilayer systems provide an inexpensive yet valuable experimental test-bed for exploring the effects of geometrically induced forces on assemblies of topological charges.

[1]Joint work with Norbert Stoop, Romain Lagrange, Jorn Dunkel and Pedro M. Reis