Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

The role of substrate pre-compression on post-wrinkling bifurcations ANESIA AUGUSTE, University of Massachusetts - Amherst, LIHUA JIN, ZHIGANG SUO, Harvard University, RYAN HAYWARD, University of Massachusetts - Amherst — Surface instabilities play key roles in a variety of contexts including flexible electronics, surfaces with switchable properties, tissue engineering and biosensors. Wrinkles for elastic bilayers are well known to result from a balance between the bending energy of the stiffer skin layer and the stretching/compression of the softer substrate. Previous work has also shown that due to non-linearity in the substrate elasticity, post-wrinkling bifurcations can also occur, corresponding to emergence of sub-harmonic modes and eventual formation of self-contacting folds. To further elucidate the role of substrate elasticity in this process, we developed an experimental system that allows independent variation of the degree of compression in the substrate and in the thin film. We found that adding pre-compression to the substrate not only substantially reduces the critical strain for emergence of sub-harmonic modes, but also qualitatively changes the evolution of post-wrinkled structures. Our findings highlight the critical importance of substrate elasticity in determining the nature of post-wrinkling bifurcation modes.

Anesia Auguste
University of Massachusetts - Amherst

Date submitted: 08 Nov 2012 Electronic form version 1.4