Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Three-dimensional Curling of Pre-strained Elastomeric Strips: From Hemi-helix to Helix JIA LIU, JIANGSHUI HUANG, TIANXIANG SU, KATIA BERTOLDI, DAVID CLARKE, Harvard University — A variety of three dimensional curls can be produced by a simple generic process consisting of pre-straining one elastomeric strip, joining it to another and then releasing the bi-strip. In thin strips we observe the formation of hemi-helices, which consists of multiple, alternating helical sections of half wavelength in opposite chiralities, separated by perversions. By contrast, helical shapes with uniform handedness are found when the cross-section is wide and flat. Finally, in the transition region between helices and hemi-helices not only the geometry effects but also boundary conditions as well as dynamic effects severely contributes. The phase separation of hemi-helical and helical structures has similarities with coiled polymer molecules and plant tendrils.

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Date submitted: 08 Nov 2012 Electronic form version 1.4