Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Spontaneous formation and evolution of kinks in elastic helical structures[1] SHUANGPING LIU, ZHENWEI YAO, MONICA OLVERA DE LA CRUZ, Northwestern University — A variety of linear entities in many biological and chemical systems can spontaneously form helical structures to realize specific functions, notably the helical ribbons found in peptide amphiphiles whose closure can further lead to the formation of tubes. Of particular interest is the coexistence of helices with opposite chiralities connected by kinks in one structure that has been found inbacterial flagella, plant tendrils and peptide amphiphiles etc, in analogy to domain walls separating regions of spin up and spin down. The spatial distribution of chirality is completely controlled by these kinks. There is no topological constraint on the number of kinks in a helical system. The introduction and evolution of kinks are largely determined energetically. In this work, using the three-dimensional pre-strained elastomeric bi-strip model, we investigate the general principles underlying the emergence of regular helical shapes and the proliferation of kinks. Specifically, it is found that if the ends of the belt can freely rotate can have significant influence on the behavior of kinks, opening the possibility of using boundary conditions to control the chirality of these systems.

[1]This work is supported by the NSF grant number 611-4735000-60035391

Shuangping Liu
Northwestern University

Date submitted: 15 Nov 2013 Electronic form version 1.4