Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Buckling-induced Tunable Chirality in Rationally-Designed Surface-Attached Cellular Structures[1] SICONG SHAN, SUNG HOON KANG, WIM NOORDUIN, School of Engineering and Applied Sciences, Harvard University, MUGHEES KHAN, Wyss Institute for Biologically Inspired Engineering, KATIA BERTOLDI, JOANNA AIZENBERG, School of Engineering and Applied Sciences, Harvard University — Chirality is crucial in understanding and controlling the behavior of living and non-living systems since the presence or absence of chirality in the structures plays important roles in their interactions with molecules, enzymes, light, and mechanical stress. Processes that induce chirality have been extensively studied at the molecular and macroscopic scales, but are relatively unexplored at the mesoscale. By rational design based on modeling, we experimentally demonstrate the controlled reversible switching between achiral and chiral configurations using swelling/de-swelling of surface-attached cellular structures. Importantly, the buckling patterns and the associated symmetry reduction of the initially achiral centrosymmetric structures could be tuned, simply by changing their dimensions. This approach opens the way to deterministically select to select the appearance of either mixed (racemic) or chiral phases. In the case of chiral transformations, spontaneous symmetry breaking resulted in the formation of large uniform areas of structures of single handedness. The fundamental understanding of this process provides a general route to designing deterministically deformable structures with dynamically switchable mechanical and/or optical properties.

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[1]Materials Research Science and Engineering Center under NSF Award No. DMR-0820484

Date submitted: 10 Nov 2011 Electronic form version 1.4