Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Polymeric Helical Microactuators: Achieving High Speed and High Extension.[1] YONGJIN KIM, ALFRED CROSBY, Univ of Mass - Amherst — We proposed novel concepts of actuation mechanism and fabrication method to induce fast and highly extensional motion in polymeric actuators. Exceptionally high extensional strain over 1400% was realized by the geometric transformation from a helix to a stretched ribbon in a responsive and reversible manner. As a model system, sub-micron sized helices were fabricated from a self-assembled, UV-cured, thermo-responsive polymer. By controlling the size and the geometrical asymmetries in the system, a combined effect of surface tension and differential volumetric strain during the transition between swollen-deswollen state induced by phase transition of the material was successfully utilized to generate torsional stresses in the system. For the full understanding of the results, a finite element analysis and measurements on the poroelastic properties of the material were conducted as well as a demonstration on macroscopic system made with PDMS. Finally, remaining questions on the chirality of helices were presented.

[1]This material is based upon work supported by, or in part by, the U. S. Army Research Laboratory and the U. S. Army Research Office under contract/grant number W911NF-15-1-0358

Yongjin Kim
Univ of Mass - Amherst

Date submitted: 11 Nov 2016 Electronic form version 1.4