Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Buckling in 2D periodic, soft and porous structures: effect of pore shape and lattice pattern SICONG SHAN, KATIA BERTOLDI, JONG-MIN SHIM, JOHANNES T.B. OVERVELDE, SUNG HOON KANG, School of Engineering and Applied Sciences, Harvard University — Adaptive structures allowing dramatic shape changes offer unique opportunities for the design of responsive and reconfigurable devices. Traditional morphing and foldable structures with stiff structural members and mechanical joints remains a challenge in manufacturing at small length scales. Soft structures where the folding mechanisms are induced by a mechanical instability represent a new class of novel adaptive materials which can be easily manufactured over a wide range of length scales. More specifically, soft porous structures with deliberately designed patterns can significantly change their architecture in response to diverse stimuli, opening avenues for reconfigurable devices that change their shapes to respond to their environment. While so far only two-dimensional periodic porous structures with circular holes arranged on a square or triangular lattice have been investigated, here we investigate both numerically and experimentally the effects of pore shape and lattice pattern on the macroscopic properties of the structures. Our results show that both the pore shape and lattice pattern can be used to effectively design desired materials and pave the way for the development of a new class of soft, active and reconfigurable devices over a wide range of length scales.

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Date submitted: 06 Nov 2012 Electronic form version 1.4