Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Effect of topological defects and curvature on anisotropic crystal growth AMIR AZADI, Department of Physics, University of Massachusetts, Amherst, GREGORY M. GRASON, Department of Polymer Science and Engineering, University of Massachusetts, Amherst — The equilibrium shapes and symmetries of crystals are vestiges of the physical principles underlying their formation. We perform particle-based simulations guided by analytical analysis to investigate the structure of crystalline domains on curved substrates, a focus on the impact of topological defects on domain morphology. We find at low area fraction, as has been argued previously, that isotropic crystal growth with relatively compact domains generates large curvature-induced strains accommodated by relative ductile interactions, while the formation of anisotropic ribbon-like structures with lower-curvature induced stresses, introduces a larger line tension cost, and is thus favored for brittle crystals. Our results show that for ductile crystals with large surface coverage, appearance of stable topological defects precludes the formation of anisotropic, ribbon domains. However branch-like structures with large interfacial area are stable for certain values of intermediate curvature and crystalline ductility. These processes are guided by the interplay between elastic shape instability, defects, and curvature, where pattern formations are not related to kinetic instabilities.

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Date submitted: 13 Nov 2014 Electronic form version 1.4