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Crystallography on Curved Surfaces VINCENZO VITELLI, University of Pennsylvania, JULIUS LUCKS, DAVID NELSON, Harvard — We present a theoretical and numerical study of the static and dynamical properties that distinguish two dimensional curved crystals from their flat space counterparts. Experimental realizations include block copolymer mono-layers on lithographically patterned substrates and self-assembled colloidal particles on a curved interface. At the heart of our approach lies a simple observation: the packing of interacting spheres constrained to lie on a curved surface is necessarily frustrated even in the absence of defects. As a result, whenever lattice imperfections or topological defects are introduced in the curved crystal they couple to the pre-stress of geometric frustration giving rise to elastic potentials. These geometric potentials are non-local functions of the Gaussian curvature and depend on the position of the defects. They play an important role in stress relaxation dynamics, elastic instabilities and melting.

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