

Abstract Submitted  
for the MAR11 Meeting of  
The American Physical Society

**Pattern switches in granular crystals** KATIA BERTOLDI, JONG-MIN SHIM, Harvard University, FATIH GONCU, University of Twente, STEPHEN WILLSHAW, TOM MULLIN, University of Manchester, STEFAN LUDING, University of Twente — We report an experimental and numerical study of a pattern transformation in a regular array of macroscopic cylindrical particles with contrasting dimensions and stiffnesses. The initial structure is a square lattice with a pair of large (soft) and small (hard) particles at each lattice site. The application of a uniaxial compression produces a new periodic structure and the transformation principally depends on the size ratio of the particles. At small ratios it is homogeneous and approximately reversible i.e. the initial geometry is almost recovered after unloading. In contrast, when the size ratio is increased the final pattern is reached after a sudden rearrangement of the particles which involves the formation of a shear band. The structural reorganization of the granular crystal will have a significant effect on wave propagation properties and we suggest that this could have interesting applications in phononic and photonic crystals.

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Date submitted: 08 Dec 2010

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