

PARAMETRIC STUDY OF 3D MICROSTRUCTURES WITH VOLUMETRIC PHASE TRANSITIONS.

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Abstract. In this work we propose and analyze several novel topological designs of metamaterial exhibiting elastic phase transitions. These phase transitions emerge as a consequence of the bistability of the metamaterials unit cell. The metamaterials achieve bistability through geometrically non-linear deformations involving chiral mechanisms and their topologies are completely defined by a few geometrical parameters. The microarchitectures differ between each other in the space group symmetry they belong to. We perform a parametric study of the bistable response of each design, and investigate the influence that the general symmetry and different unit cells shape have. Our analysis also includes an approximation of the macroscopic responses, obtained by analyzing a sampling volume composed of many unit cells, and the microstructure (pattern) formation in order to achieve lower-energy equilibrium configurations.