

Society of Engineering Science 51st Annual Technical Meeting

1–3 October 2014

Purdue University, West Lafayette, Indiana, USA

3D buckligami: combinatorial mechanical metamaterials

van Hecke, Martin, mvhecke@gmail.com; Coulais, Corentin; Florijn, Bastiaan, Leiden University,
The Netherlands

ABSTRACT

We present a class of elastic structures which exhibit collective buckling in 3D, and create these by a 3D printing/moulding technique. Our structures consist of cubic lattice of anisotropic unit cells, and we show that their mechanical properties are programmable via the orientations of all unit cells. Collectively buckling, but nonperiodic, structures can be found by solving a combinatorial problem related to spin ice. Such nonperiodic structures present a novel pathway to maximally auxetic, isotropic metamaterials.