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A study of 3D Printed Metamaterials Origami Structure for Mechanical Energy Absorption

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Origami-based structures—structures that are inspired by Japanese ancient art of folding uncut sheets of paper—have shifted from art to engineering design for recent decades.
Owing to their unique characteristics and mechanical properties, folded structures and origami architecture recently gained a lot of interest in broad fields of application focus-ing on space exploration, medical devices and implants, robotics and automation, and mechanical engineering. Although origami-based structures offer excellent potential in building 3D complex structures via programmable 2D folding patterns, few studies have focused on the mechanical performance—particularly energy absorption which plays an important role on their folding process—of origami-based structures.
The aim of this work is to develop new type of origami-based structures with enhanced energy absorption capabilities. A commercial finite element software is employed to comprehensively study linear and nonlinear behaviors of origami-based structures. The designed origami-based structures will be subjected to uniaxial compression at quasi-static condition and impact loading. The numerical results have clearly demonstrated the excellent energy absorption capabilities of newly designed origami-based structures, which offer great opportunities for advanced industrial applications.
The overall goal being the identification of the most promising origami-based structure that can be implemented in the automobile field.

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