Auxetic metamaterials of square structure

Yu Zhou, Zishun Liu*

International Center for Applied Mechanics, State Key Laboratory for Strength and Vibration of Mechanical Structures, Xi'an Jiaotong University, Xi'an, China, 710049 Email address: <u>zy2140405050@stu.xjtu.edu.cn</u>; <u>zishunliu@mail.xjtu.edu.cn</u>;

Abstract:

Auxetic metamaterials are a novel class of materials whose properties can be tuned by modifying their internal structures. They can exhibit an interesting property of negative Poisson's ratio. In order to investigate the effects of geometric parameters on the structure's Poisson's ratio and equivalent Young's Modulus, we designed a 2D cellular structure achieved by removing trapezoid surface on the vertical ribs and fabricated a family of auxetic metamaterials via 3D printer. We compare both experiments and finite element simulations and get consistent results. In this study, we find that the structure was sensitive to some of the geometric parameters. The auxetic performance and stiffness can be tuned by the geometry of structures and the desired structure property can be achieved by structure optimization

Keywords: Auxetic, Negative Poisson's ratio, Structural, Elastic properties