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Characterization of 3D Printed Re-Entrant Chiral Auxetic Geometries

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Abstract : Auxetic materials have counteractive properties due to re-entrant geometry that enables them to possess Negative Poisson’s Ratio (NPR). These materials have better energy absorbing and shock resistance capabilities as compared to conventional positive Poisson’s ratio materials. The re-entrant geometry can be created through 3D printing for convenient application of these materials. This paper investigates the mechanical properties of 3D printed chiral auxetic geometries of various sizes. Small scale samples were printed using an ordinary 3D printer and were tested under compression and tension to ascertain their strength and deformation characteristics. A maximum NPR of -9 was obtained under compression and tension. The re-entrant chiral cell size has been shown to affect the mechanical properties of the re-entrant chiral auxetics.

Keywords : auxetic materials, 3D printing, Negative Poisson’s Ratio, re-entrant chiral auxetics
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