

The Road to Tunable Structures: Comparison of Experimentally Characterised and Numerical Modelled Auxetic Perforated Sheet Structures

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Abstract : Auxetic geometries allow the generation of a negative Poisson ratio (NPR) in conventional materials. This behaviour allows materials to have certain improved mechanical properties, including impact resistance and altered synclastic behaviour. This means these structures have significant potential when it comes to applications as chronic wound dressings. To this end, 6 different "perforated sheet" structure types were 3D printed. These structures all had variations of key geometrical features included cell length and angle. These were tested in compression and tension to assess their Poisson ratio. Both a positive and negative Poisson ratio was generated by the structures depending on the loading. The a/b ratio followed by θ has been shown to impact the Poisson ratio significantly. There is still a significant discrepancy between modelled and observed behaviour.

Keywords : auxetic materials, 3D printing, negative Poisson's ratio, tunable Poisson's ratio

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