FINITE ELEMENT MODELLING RESEARCH GROUP

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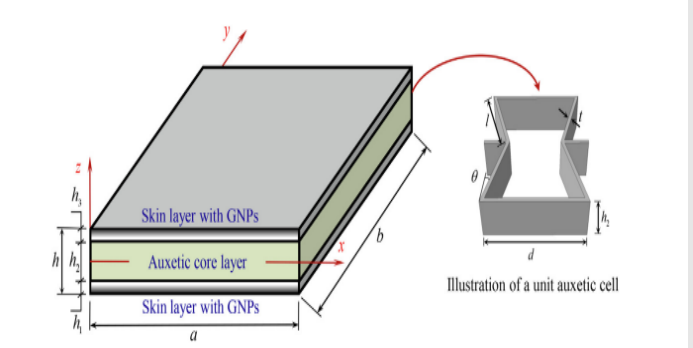
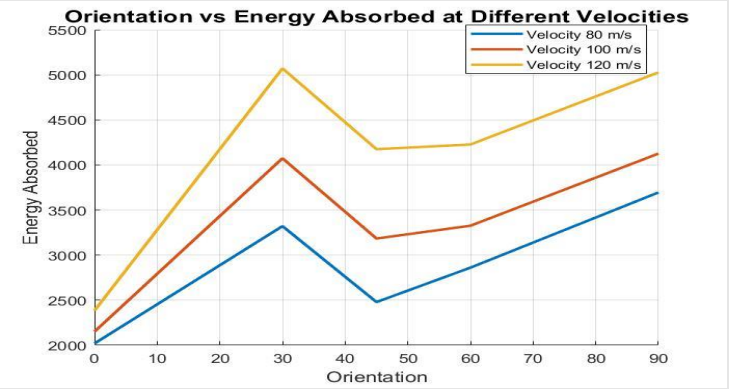
OPTIMIZATION OF AUXETIC HONEYCOMB CELL PARAMETERS FOR HIGH ENERGY ABSORPTION

Introduction

Combining auxetic honeycomb sandwich structures with nanoplates enhances mechanical properties, offering significant potential in the mechanical and aerospace industries. Sandwich nanoplates minimize damage and provide effective vibration dampening by absorbing high energy, which is essential for structural integrity. Optimizing honeycomb cell parameters such as re-entrant angle, length, height, and thickness can enhance energy absorption capabilities of nanoplates for better structure performance.





Methodology

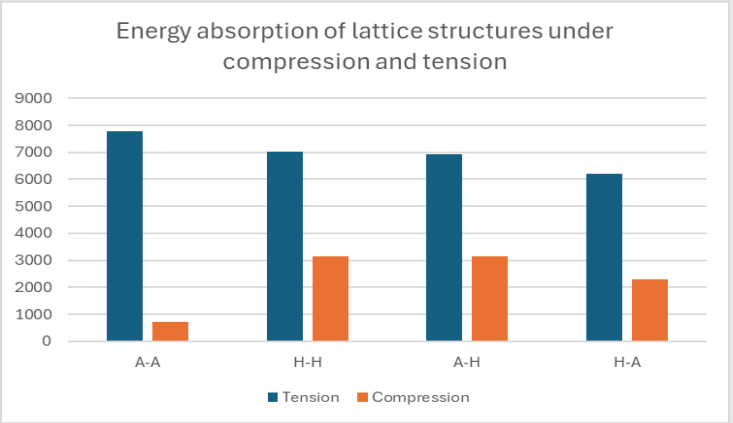
Parametric study of honeycomb cell on energy absorption.

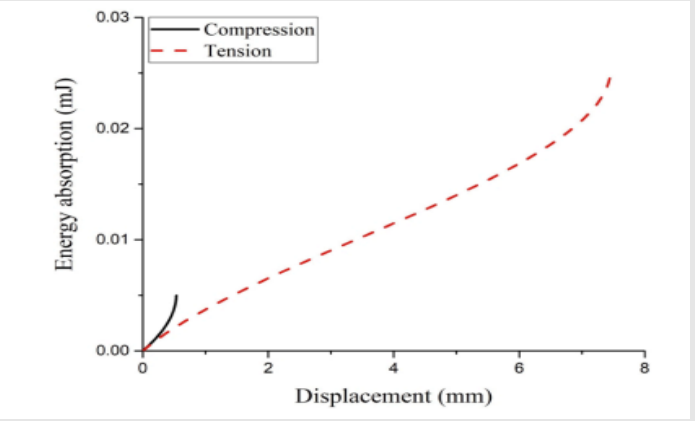
Study of energy absorption of lattice structures for compressive and tensile loadings

Objective function with high energy consideration and light weight.

Failure criteria for the auxetic honeycomb cells which are:

- Shear buckling
- Shear Yielding





Results and Discussions

- Generally increased thickness can lead to high energy absorption due to increased strength.
- Increased angle can lead to increase negative Poisson 's ratio, which enhances energy absorption capability but also depends on loading conditions.
- Honeycomb cell absorb more energy in tension rather than in compression loading, because of more plastic deformation.
- Energy absorption in auxetic honeycomb cell is more than various types and combinations of lattices.

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