

Introduction

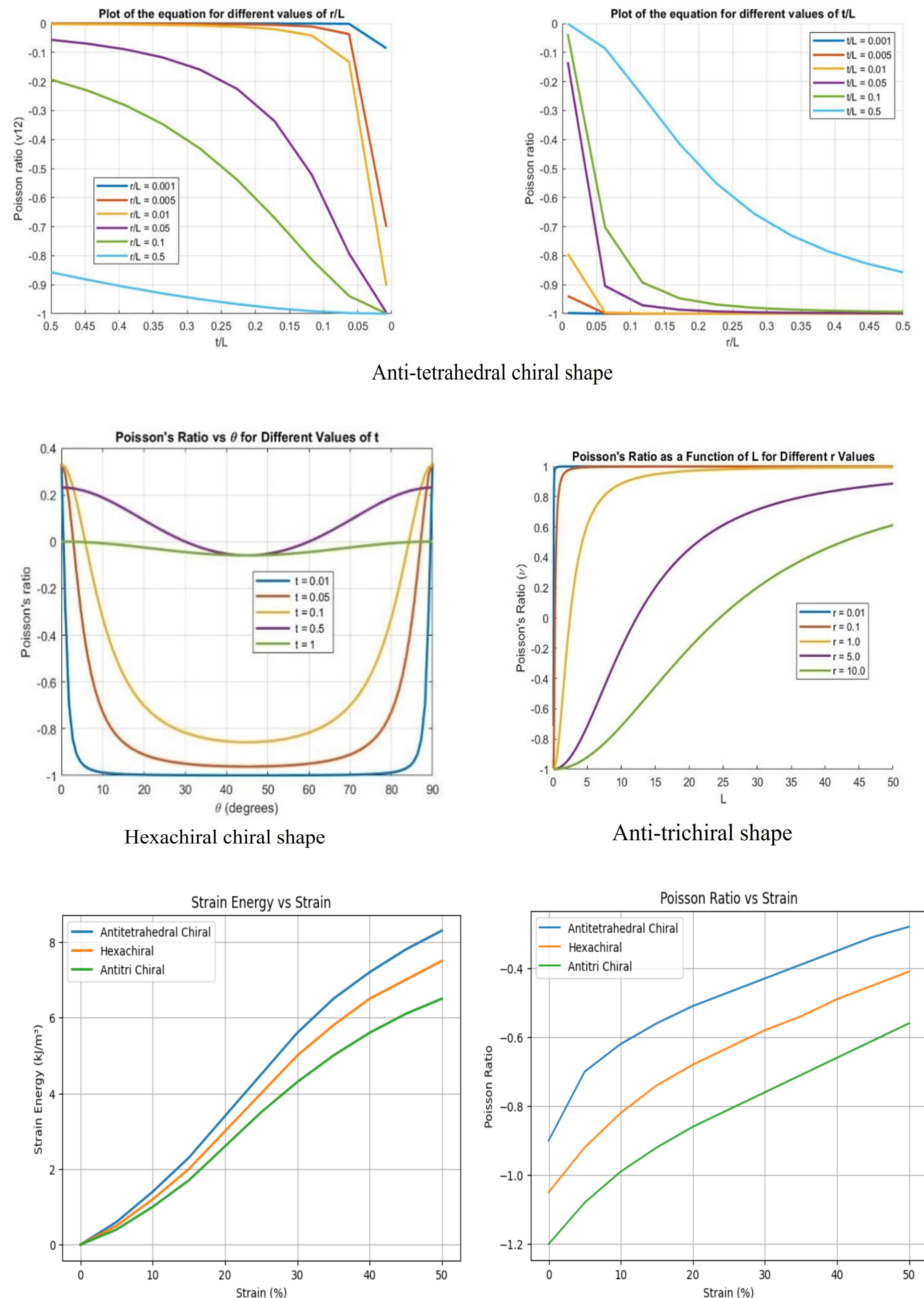
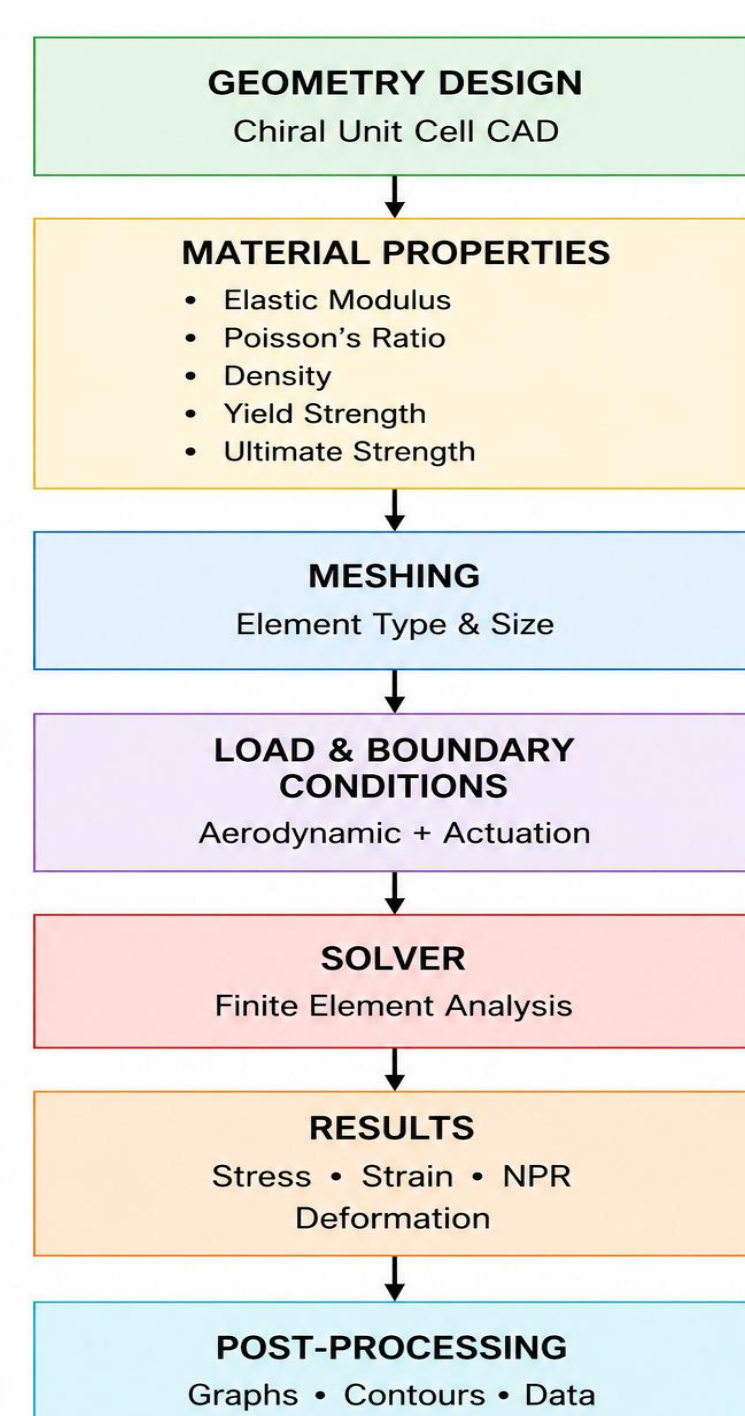
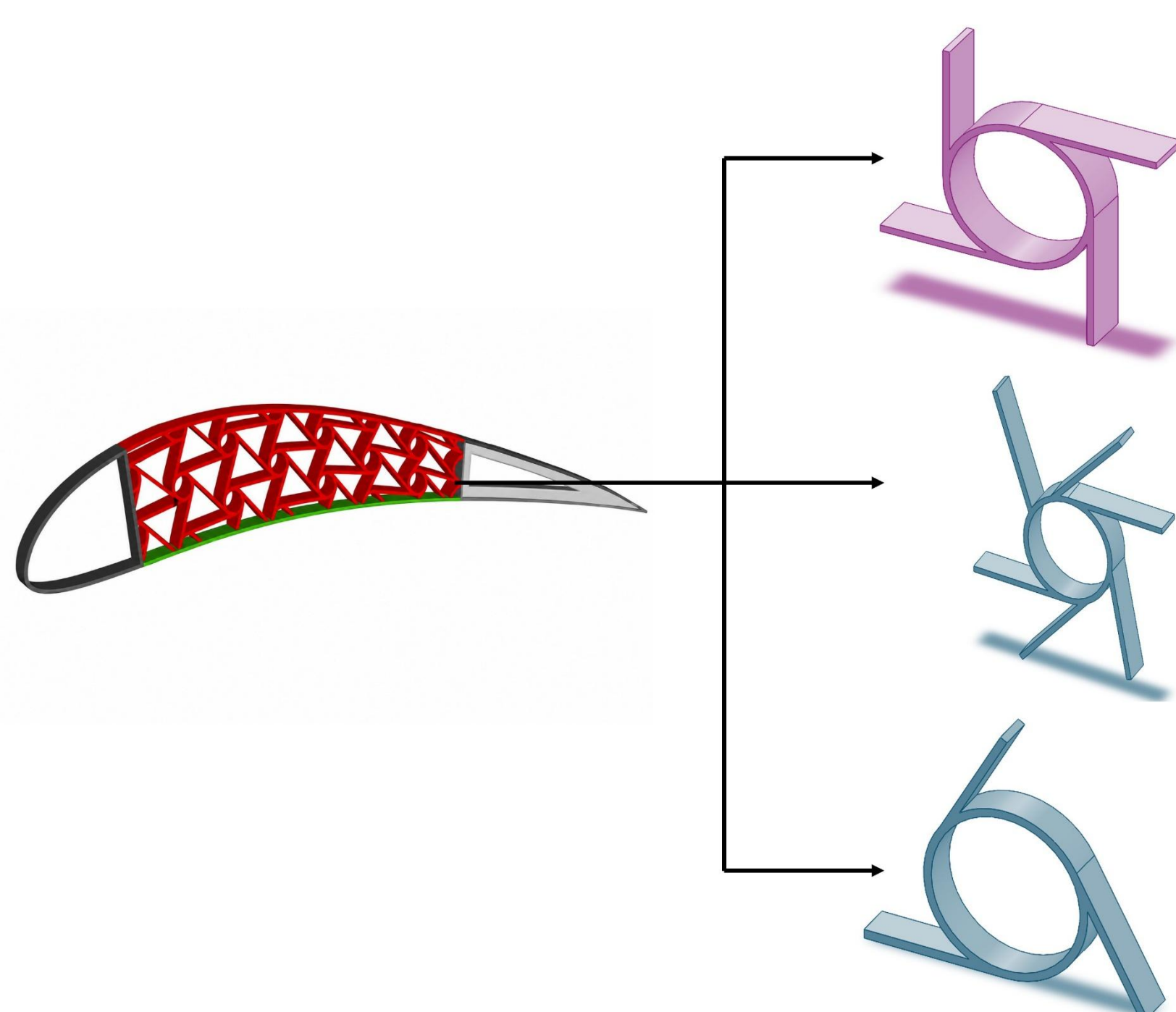
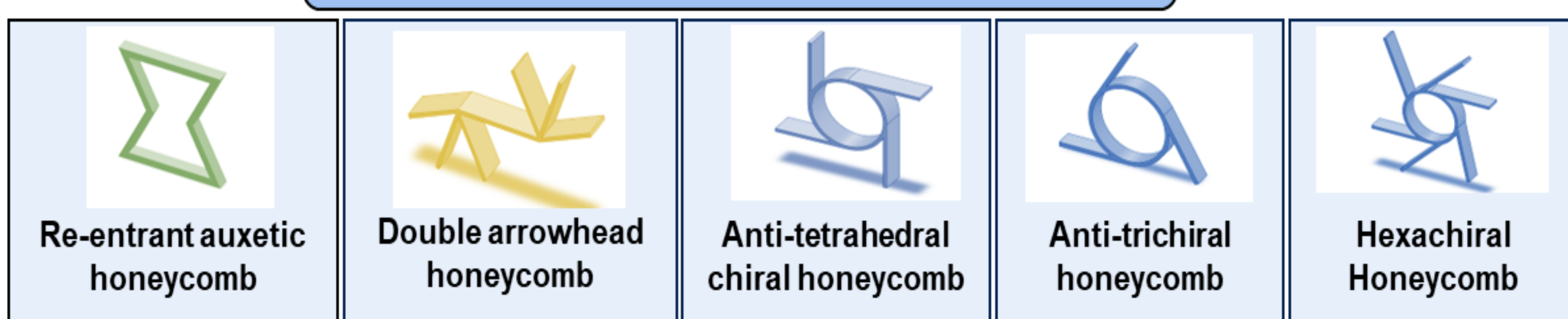
- Morphing wings adapt their shape to changing aerodynamic conditions.
- Conventional wing cores have limited flexibility and deformation capability.
- Chiral auxetic structures provide a negative Poisson's ratio and high shear flexibility.
- Auxetic cores enable smooth camber change with lightweight structural support.

Methods

- Design of chiral auxetic unit cell geometry.
- Finite element modeling of the morphing wing core.
- Parametric study of node radius, ligament length, and thickness.
- Multi-objective optimization for compliance, mass, and actuation force.
- Evaluation under aerodynamic and morphing loading conditions.

Graphics / Images

Shapes of sandwich core structures



Conclusions

- Chiral auxetic cores significantly improve morphing capability in aircraft wing structures.
- Anti-tetrahedral chiral structures show the highest morphing compliance and camber deformation.
- Hexachiral structures provide balanced flexibility and structural stiffness.
- Anti-tri chiral structures exhibit lower deformation with improved stability.
- Optimized auxetic cores support lightweight morphing wings