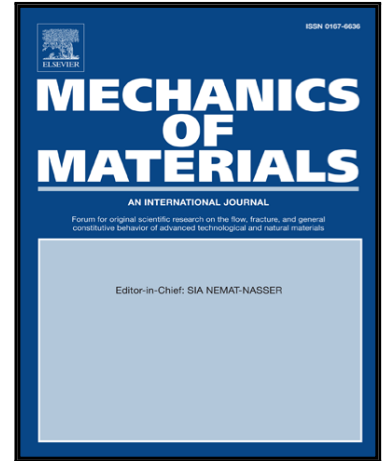


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A mechanism-based architected material: a hierarchical approach to design Poisson's ratio and stiffness

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Highlights

- We demonstrated that an orthogonal and off-axis arrangement of cylindrical holes and prismatic slits of Complainant Porous Structures (CPS) enables one to build a metamaterial to have multi-stiffness and dual Poisson's ratio - having both positive and negative Poisson's ratios at the same time for different directions.
- We constructed a nonlinear constitutive equation of the metamaterial including contact of slit surfaces of CPS, generating a sudden increase of stiffness after the contact without changing mass density.
- We applied a hierarchical design approach of lattice structures to explore the effect of tessellation of CPS on the mechanical properties of metamaterials.
- We conducted a parametric study with geometric variables, providing a guideline for the design of CPS.

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