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Architectured Materials are an emerging class of advanced materials that bring new possibilities in terms of functional properties, filling gaps in Ashby's material performance maps. The term architectured materials describes any heterogeneous material that exhibits improved specific properties due to a thoughtful and predetermined morphology and/or topology design. This usually induces characteristic length-scales comparable to the size of the final component being produced, i.e. the millimetre scale in the case of lattice structures. Different strategies have been studied in the literature for mitigating the surface defects of additively manufactured metallic lattices: chemical etching, electro-erosion, mechanical polishing. A new proposition is presented in this work: polymer coating or embedding of metal struts, by analogy to the soft-hard turtle-like strategy for mitigating crack propagation. Besides processing of such architectured lattice structures, the present work brings experimental and numerical results concerning the mechanical behaviour in compression for negative Poisson's ratio lattices, also known as auxetics. As a matter of fact, one engineering challenge is to predict the effective mechanical properties of architectured materials; computational homogenization using finite element analysis is a powerful tool to do so when considering quasistatic behaviour [1-3]; difficulties arise when analysing the effective damping behaviour. A straightforward solution is to rely on full-field finite element dynamic simulation, accounting for both the intrinsic viscoelastic damping of the constitutive material, as well as the structural damping due to the geometrical definition of the lattice structure considered in the present work. Homogenized behaviour of architectured materials can thus be used in large structural computations, hence enabling the dissemination of such materials in the industry. Comparison is made between the metal and hybrid lattice structures.

References :

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[3] J. Dirrenberger, S. Forest, D. Jeulin, *Int. J. of Mechanics and Materials in Design*, **9**(1), pp. 21-33, 2013.
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