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ADVANCES IN MODELING AND DESIGN OF ADDITIVELY MANUFACTURED METAMATERIALS

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ABSTRACT

Architected metamaterials offer remarkable opportunities to tailor mechanical and physical properties through the design of their internal structure. Recent advances in additive manufacturing have significantly expanded the range of realizable architectures, opening new possibilities for the development of materials with unconventional and multifunctional responses. This Invited Session will highlight recent theoretical, computational and experimental advances in the modeling and design of additively manufactured metamaterials.

The session will focus on innovative approaches to understanding and predicting the behavior of architected materials, with particular attention to the relationship between their microstructure, manufacturing processes and overall performance. It will encourage discussion on emerging challenges in computational modeling, material design and optimization, as well as on the opportunities offered by additive manufacturing for engineering applications.

Topics include, but are not limited to: (i) homogenization and multiscale computational methods; (ii) finite and virtual element formulations and advanced numerical techniques; (iii) topology, shape and parametric optimization, and inverse design; (iv) wave propagation, vibration control and band-gap engineering; (v) chiral, auxetic, hierarchical and graded architectures; (vi) multiphysics and generalized continuum modeling; and (vii) numerical and experimental characterization of additively manufactured metamaterials, including the effects of manufacturing imperfections.