

# Advanced Metacomposites: Designing Unique Properties for Extraordinary Dynamic Performances



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#### ABSTRACT

In this talk, I will first introduce our research group's three main areas of interests: advanced composites, elastic metamaterials and biomimetic structures. Huge reduction in arctic ice region in recent years has spurred tremendous interest to explore material performances at extreme low temperature environment. I will present results involving the impact performance and dynamic behavior of composite sandwich structures in low temperature arctic conditions. The main part of my talk will next be focused on the design and development of locally resonant metamaterials to enact negative effective mass density. This results in extraordinary dynamic performances, including frequency-sensitive wave attenuation, two-dimensional wave redirection and one-way asymmetric wave transmission. Further miniaturization in microstructural design can create nanostructures for THz wave control. We demonstrate the use of branched nanopillars to reduce thermal wave propagation. Our work utilizes a combined analytical, computational and experimental approach to understand the dynamic performances of advanced metacomposites.

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