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Multifunctional Applications of Nanostructured Mechanical Metamaterials[1] LIFENG WANG, Department of Civil & Environmental Engineering, Clarkson Univeristy — Mechanical metamaterials have been shown to possess extraordinary properties, and thus have been of great interest to mathematicians, physical scientists, material scientists, and biologists. A large part of the study of materials science is to obtain new structure-property-function relationships needed for achieving optimized mechanical properties. Here, we demonstrate the potential to design and fabricate periodically ordered structures. These structures are shown to have a unique combination of stiffness, strength, and energy absorption, as well as damage tolerance. The results provide guidelines to advance the digital design (materials by design) and manufacturing concepts (advanced manufacturing) into the realm of engineered materials with desired properties and further to create multifunctional materials. For example, the periodic nature of the structures enables mechanically tunable band gap (phononic or photonic) materials, and tunable sensors in tissue engineering.

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