Mechanical Enhancement of Core-Shell Microlattices through High Entropy Alloy Coating

Mr. SURJADI James Utama
PhD student
Department of Mechanical Engineering
City University of Hong Kong

Abstract
Mechanical metamaterials such as microlattices are an emerging kind of new materials that utilize the combination of structural enhancement effect by geometrical modification and the intrinsic properties of its material constituents. Prior studies have reported the mechanical properties of ceramic or metal-coated composite lattices. However, the scalable synthesis and characterization of high entropy alloy (HEA) as thin film coating for such cellular materials have not been studied previously. Herein, stereolithography (3D-printing) was combined with Radio Frequency (RF) magnetron sputtering to conformally deposit a thin layer (~ 800 nm) of CrMnFeCoNi HEA film onto a polymer template to produce HEA-coated three-dimensional (3D) core-shell microlattices for the first time. The presented polymer/HEA hybrid microlattice exhibits high specific compressive strength (~ 0.018 MPa kg-1 m3) at a density well below 1000 kg m-3, significantly enhanced stiffness (> 5 times), and superior elastic recoverability compared to its polymer counterpart due to its composite nature. The findings imply that this highly scalable and effective route to synthesizing HEA-coated microlattices have the potential to produce novel metamaterials with desirable properties to cater specialized engineering applications.
About the Speaker

Mr. James Utama Surjadi is a Ph.D. candidate in the Department of Mechanical Engineering at City University of Hong Kong. He received a bachelor’s degree in Mechatronic Engineering from City University of Hong Kong in 2017. His current research interests include the design, fabrication, and in-situ characterization of mechanical metamaterials.

All are Welcome!

Enquiry: 3442 8420

MNE Seminar 2018-19_08RS