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Mechanical Engineering Seminar Series

High Performance Architected Materials for Safety Critical Applications

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Room 1200 EECS

Tuesday, March 28, 2023

3:00 PM

ME Seminar Zoom link

Passcode 309714

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Abstract

Architected materials are lightweight with high specific strength and excellent energy absorption, holding great promise for a range of applications, including automobiles, aerospace, and space. However, the absolute strength of such materials is low due to the removal of base material. To enhance the strength, stretch-dominated architectures are used, but they suffer post-yield collapses, severely limiting their energy absorption and post-yield stability, which are critical for structural applications. We recently developed a new approach that combines the science of metals, 3D printing, and architecture to design a new class of lightweight architected materials with high absolute strength and tunable properties. The approach includes a mimicry of the crystalline microstructure to translate key metallurgical strengthening mechanisms in metallic alloys to mesostructure scales, creating artificial crystals with new strengthening sources in architected structures [1-5]. The approach offers new ways of achieving high strength, stability, energy absorption, and excellent opportunities of tuning mechanical behaviour to specific locations thanks to the plethoral combination of crystal-like architectures and metallurgical microstructures

Bio

Dr. Son Pham is a senior lecturer (equivalent to a tenured associate professor) in Engineering Alloys at Imperial and currently leads a dynamic research group focusing on alloy design, mechanical metamaterials, advanced manufacturing, mechanical integrity (fatigue, creep, hydrogen embrittlement and fracture) and crystal plasticity modelling. His excellent track record in research includes > 40 peer-reviewed publications, including ones in Nature, Nature Communications, and > 15 keynotes and invited talks at major international conferences and meetings in mechanical integrity, metallurgy, and advanced materials (e.g., Additive Manufacturing International, ICMAT, Thermec, TMS conferences). His research has been recognized via a series of accolades awarded in the UK, USA, and Switzerland, including the ETH Medal. Dr. Pham has established extensive collaboration with leading academics (Sheffield, Cambridge, Hammersmith hospital, ETHZ, CMU, and NIST) and industrial experts (Rolls Royce, BP, BIAM, AWE, and Cross Manufacturing) to tackle mechanical engineering problems in energy, automobiles, aerospace, defense, and medical devices.
The full list of Dr. Pham's publications can be found at: https://scholar.google.be/citations?hl=en&user=Q5pmU8QAAAAJ

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