Title and Team

Ultralight Lattice-based Materials for Multifunctional Space Structures

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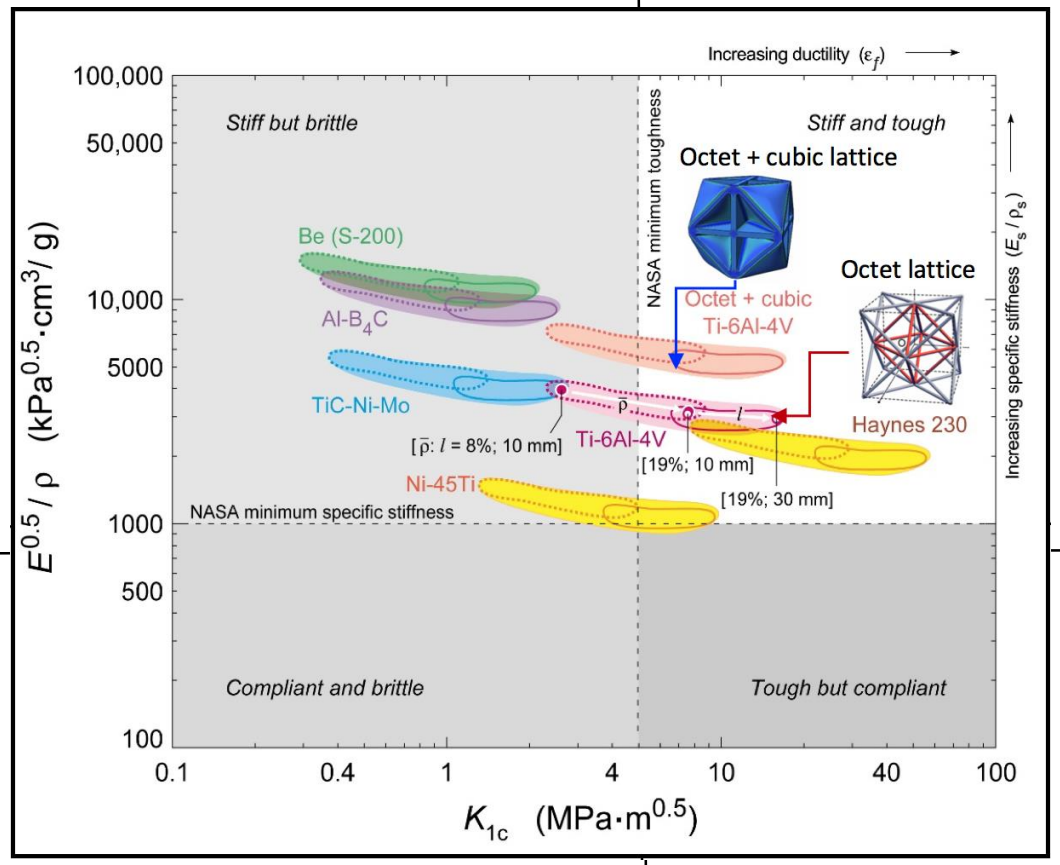

Research objectives

- Investigation of design methods for ultralight lattice materials with density of 200-800 kgm^{-3}.
- Assessment of additive, snap-fit and subtractive manufacturing methods for octet lattice structures.
- Fabrication of open cell octet lattices from light and high temperature alloy systems with balance of properties exceeding NASA objectives.
- Development of novel concepts for fabrication of closed cell octet + cubic foam lattices.

Approach

- Micromechanics based topology optimization for design of open and a closed cell lattices.
- Selection of metallic alloys to meet NASA objectives and balance of other properties (strength, fatigue and corrosion resistance).
- Development of scalable manufacturing routes for 3D secondary space structure (1 m^3).

Potential impact

- New class of advanced engineered lattice materials for lightweighting spacecraft structures.
- Mass reductions for secondary space structures of >20% over current SOA.
- Multifunctional open cell lattices with that exploit anisotropy meet/exceed NASA mechanical property objectives and provide novel thermal management and vibration damping control.
- Closed cell octet + cubic foam secondary space structures with exceptional specific stiffness and multifunctional debris protection and impact energy absorption properties.