

Mechanics of bio-inspired architected materials and interfaces

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Current developments in the area of engineering materials are driving the research & development of stronger, tougher and multi-functional lightweight materials. Specific microstructures, heterogeneities or hybrid compositions observed in biological materials -such as bone, teeth or mollusk shells- inspired the fabrication of architected materials. These last embed tailored structures, with length scales that can span from the microscale to the size of the component, which are made of stiff building blocks connected through deformable bio-adhesives. The interplay between the properties of the building blocks (e.g. shape, size and arrangement) and non-linear interfacial behavior endows the material unusual combinations of stiffness, strength and toughness. As a result, biomaterials possess mechanical or other physical properties by far superior than their constituents, e.g. high strength and fracture toughness – two key structural properties which tend to be mutually exclusive. This symposium welcomes contributions highlighting the general principles underlying the mechanics of bio-inspired architected materials and structural interfaces. Discussions held will cover a variety of topics, however the focus will be upon application-oriented problems through which recent progress and remaining issues in the modeling, design optimization and fabrication of these materials are highlighted.

Key topics of discussion will include:

- bio-inspired structural interfaces and composites
- architected materials
- multifunctional, smart and adaptive materials
- topologically interlocked materials
- lattice structures
- bio-inspired damage tolerant materials
- bio-inspired joints and connections