

Innovative lattice materials and structures

Organizers:

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Nowadays, an increasing number of studies are devoted to mechanical metamaterials, and, in particular, to latticed materials and structures with properties originating from their particular geometry. At the same time, there is a growing demand for exploiting the potential of such systems in real-life engineering applications. This Symposium is aimed at deepening the fundamental understanding of lattice mechanics, and its discrete characters, for designing materials and structures with enhanced performances.

The contributions to the Symposium will deal with unconventional materials and structures in several engineering fields (including civil, materials, bio-, mechanical, and aeronautical engineering). The research focus will be on designing new tunable lattices, and applying lattice-based metamaterials to the fabrication of novel engineered materials and structures. In addition, attention will be devoted to nanoscale systems (such as carbon allotropes and molecular structures) and to coarse-grained models of complex systems. Contributions on modeling issues will be aimed at designing lattices with arbitrary behaviors. Contributions focusing on multi-scale aspects will deal with novel dynamic devices and hierarchical composite materials. Contributions on structures at larger scales will be related, but not limited, to applying morphing lattices to the design of anti-seismic devices and smart buildings.

Nano-, micro- and macro-scale lattice materials will be studied through a closed-loop approach, which includes the computational design and the manufacturing of physical models via innovative fabrication techniques. Experimental studies dealing with reproducing and assessing theoretical results are welcome. For nano-materials, theoretical models that bridge from the atomistic scale to the macro-scale, in order to conduct and interpret experimental tests and measures, are also invited.

In summary, this Symposium will bring together studies on theoretical aspects, computational modeling, and experimental behavior of lattice materials and structures, with particular reference to:

- Metamaterials,
- Tensegrity structures and prestressed lattices,
- Auxetic materials,
- Carbon allotropes (graphene, nanotubes) and molecular structures,
- Coarse-grained models of complex systems
- Multi-scale analysis of materials with lattice micro-structure,
- Homogenization of lattice materials.