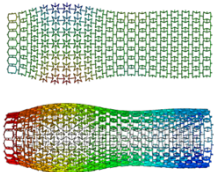




Magic of Phononics and Metamaterials

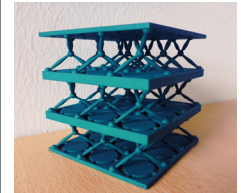
Z.Zhang, N.Anerao, A.O. Krushynska

Metamaterials



Mechanical
 metamaterials

Mechanical metamaterials are engineered materials with unconventional mechanical and material properties outperforming those of the constituent materials. For example, extra-large negative Poisson's ratio, zero or negative effective mass density, programmable shape-morphing, etc.
Acoustic metamaterials and **phononic materials** reveal extreme acoustic and dynamic characteristics driven by their architecture. Prominent examples include low-frequency wave control and attenuation, negative refraction, acoustic cloaking, etc.



Phononic
 material

Our research

We focus on the design and testing of acoustic, phononic and mechanical metamaterials to unveil and promote their applications in various fields.

Our materials reveal unprecedented shape-morphing, tunable and programmable properties, enable vibration & noise control and isolation, and contribute to a circular economy approach by enabling smart energy conversion mechanisms.

Their carefully developed architecture and topology deliver lighter and smaller materials with a greater performance as compared to traditional solutions available in the market.

Size scale: from μm to cm

Materials: polymers, metals, resins, paper

Manufacturing: cutting, additive manufacturing

Behavior:

- soft & rigid materials
- shape-morphing
- energy conversion
- auxetic & bio-inspired
- aperiodic materials

Applications

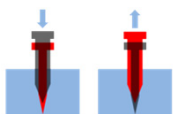
Mechanical metamaterials



Flexible
 sensors



Meta-
 implants



Auxetic
 nails



Smart
 shoes

Acoustic metamaterials



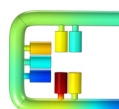
Noise
 Control



Energy
 Harvesting

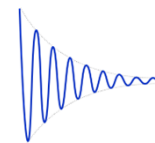


Noise
 Barriers

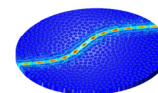


Acoustic
 Absorbers

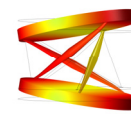
Phononic materials



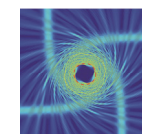
Damping



Waveguiding



Filtering &
 sensing



Black
 holes



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