

## **Elastic metamaterials and wave steering**

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Elastic metamaterials are composites with special properties not easily found in nature materials, such as negative effective bulk modulus, mass density and shear modulus. They may have a great potential in controlling low-frequency elastic waves. In this talk, we will explain how to realize these elastic metamaterials by exploring the microstructure of materials. The principle will be first illustrated by simple mass-spring models, and the negative effective material parameters for a composite with coated inclusion are then related to monopole, dipole and quadruple resonances of the coated inclusion. A more compact design for an elastic metamaterial with simultaneous negative effective bulk modulus and mass density is also discussed with help of chiral lattice with resonant inclusion, the negative refraction of this type of metamaterial is predicted and confirmed by experiment. Three possible applications are explained as examples for the use of these materials, the first one is the design of metamaterials for low frequency sound isolation, the second is a metacomposite beam for low-frequency vibration alleviation and the last one is steering elastic wave based on transformation technique.