

## Acoustic Metamaterials And Wave Control Frontier Research In Computation And Mechanics Of Materials

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### Acoustic Metamaterials And Wave Control

As an emerging interdisciplinary field, acoustic metamaterials have generated increasing interests for diverse engineering applications, from noise and vibration alleviation to super-resolution imaging.The book starts with a simple mass-in-mass chain model to illustrate the concept of negative mass due to internal resonance and its impact on wave transmission.

### Amazon.com: Acoustic Metamaterials and Wave Control ...

Acoustic metamaterials can manipulate and control sound waves in ways that are not possible in conventional materials. Metamaterials with zero, or even negative, refractive index for sound offer...

### Controlling sound with acoustic metamaterials | Nature ...

An acoustic metamaterial, sonic crystal, or phononic crystal, is a material designed to control, direct, and manipulate sound waves or phonons in gases, liquids, and solids (crystal lattices). Sound wave control is accomplished through manipulating parameters such as the bulk modulus  $\beta$ , density  $\rho$ , and chirality.

### Acoustic metamaterial - Wikipedia

Acoustic metamaterials: Metamaterials for wave control and manipulation by exploring nonlinearity The development of metamaterials enables to engineer materials with extraordinary features, beyond the traditional limits.

### Acoustic metamaterials: Metamaterials for wave control and ...

The book starts with a simple mass-in-mass chain model to illustrate the concept of negative mass due to internal resonance and its impact on wave transmission. The practical transformation theory for controlling acoustic waves is explained. Pentamode acoustic metamaterials and related cloaking design are also included.

### Acoustic Metamaterials and Wave Control | Frontier ...

High resolution diagnostic ultrasound imaging requires the use of high frequency acoustic transmission deep into the body. However, the presence of high impedance, lossy barriers such as the skull scatters and damps the energy delivered to the targeted region, limiting the usefulness of ultrasound for brain imaging and brain therapies. Non-Hermitian complementary metamaterials (NHCM) are ...

### Non-Hermitian Complementary Acoustic Metamaterials for ...

artificial acoustic metamaterial for attenuation of the sound wave. Following this pioneering work, in the past two decades, various acoustic metamaterials have been presented that offered unprecedented abilities for the sound wave manipulation. Acoustic metamaterials are the artificially

### Review Recent advances in acoustic metamaterials for ...

With the advent of acoustic metamaterials 39, which allow phase engineering on impinging sound waves using unit elements with a surface area smaller than the one of the corresponding transducers,...

### Acoustic levitation with optimized reflective metamaterials

The explosion of interest in metamaterials is due to the dramatically increased manipulation ability over light as well as sound waves. This material research was stimulated by the opportunity to develop an artificial media with negative refractive index and the application in superlens which allows super-resolution imaging.

### ACOUSTIC METAMATERIAL DESIGN AND APPLICATIONS BY SHU ZHANG ...

Flexible and integrated sensing platform of acoustic waves and metamaterials based on polyimide coated woven carbon fibers | ACS Sensors Versatile, in situ sensing and continuous monitoring capabilities are critically needed but challenging for components made of solid woven carbon fibers in aerospace, electronics and medical applications.

### Flexible and integrated sensing platform of acoustic waves ...

Description The purpose of this dissertation is to model, simulate and design metamaterials for underwater sound and elastic wave control. Water-based acoustic metamaterials usually suffer from low transmission due to the impedance mismatch with water; elastic metamaterials also suffer from this issue not only because of the impedance mismatch to the host medium, but also due to the multiple wave types existing simultaneously at the interface between the inclusions and the background matrix.

### Controlling acoustic and elastic waves with metamaterials

Numerical experiments illustrating the theoretical results and metamaterial wave propagation, are included. In this paper we develop a finite element method for acoustic wave propagation in Drude-type metamaterials. The governing equation is written as a symmetri ...

### A Mixed Method for Time-Transient Acoustic Wave ...

Acoustic metamaterials, as one significant branch of metamaterials, are designed to manipulate and control the dispersive properties of vibrating wave propagation. Comparing to phononic crystals which are designed to control wave through Bragg scattering [13] , [14] , acoustics can also generate local resonance properties to control and guide wave propagation [15] .

### Active control for acoustic wave propagation in nonlinear ...

The study of electromagnetic and acoustic waves is an endeavor that dates back centuries. An important sub-domain of this field that effects our daily life is the use of acoustic principles to control environmental noise. In this regard, acoustic materials, which are materials designed to manipulate sound wave propagation, are of prime importance.

### Acoustic Materials and Metamaterials - Course

The development of acoustic, phononic, and mechanical materials and the resulted control of wave propagation at will has been a fast-developing research field in the past decades. Negative mass density was first realized in sonic crystals near dipolar resonance of the unit cells in 2000.

### Developments in Acoustic, Phononic, and Mechanical ...

Researchers have used 3D printing to develop acoustic metamaterials that can be tuned to different frequencies—something that is a rare quality in these types of structures and opens the door to new applications of them. The metamaterials, which are capable of blocking sound waves and mechanical ...

### Researchers Can Tune Acoustic Metamaterials on Demand ...

Initially proposed to achieve strong noise isolation levels beyond the mass-density law, acoustic metamaterials (AMMs) have now overturned the conventional views in all aspects of sound propagation and manipulation.

### Active times for acoustic metamaterials - ScienceDirect

This class of acoustic metasurface provides an efficient design methodology enabling complete acoustic wave manipulation, which may find utility in applications including biomedical imaging, acoustic communication, and non-destructive testing.

### Acoustic Metamaterials and Metasurfaces - Boston University

The topology concept in the condensed physics and acoustics is introduced into the elastic wave metamaterial plate, which can show the topological property of the flexural wave. The elastic wave...

### Active control on topological immunity of elastic wave ...

Acoustic invisibility is just one aspect of the broad concept of transformation acoustics, in which carefully designed materials can deform or control sound waves in almost arbitrary ways.