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Elastic Structures with Controllable Edge-propagating Acoustic Modes

A versatile material has been developed that uses tunable inversion symmetry lattices to precisely control and isolate acoustic waves for improved noise and vibration management, energy harvesting, and advanced device design.

Acoustics is a branch of physics related to the properties of sound; it dates back to the 6th century BC. Since this time, there has been interest in sound waves and how to control and manipulate them. The study of acoustics have advanced to a deep understanding of acoustic waves and how different materials can affect them. New methods of noise and vibration control within materials is the next step towards a more proper utilization of sound waves.

Researchers at Purdue University have developed a material capable of controlling and isolating acoustic waves. Using lattices with controllable inversion symmetry, allows for tunable acoustic edge states. This simply means that the materials can be modified to control the sound waves in several different ways, making it very versatile. This technology has numerous applications including vibration and noise control of lightweight thin-walled aerospace/marine/civil structures, energy harvesting devices, control of surface acoustic wave for acoustic device design, such as biomedical, telecommunications, etc., on-chip microfluidic devices, and high transmission acoustic channels.

Advantages:

-Controllable acoustic pathways

-Scalable for different frequency ranges

-Can use any solid material that supports elastic wave propagation

-Ability to isolate and harvest energy of waves

Potential Applications:

-Vibration and noise control

Technology ID

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Category

Materials Science & Nanotechnology/Advanced Functional Materials

Aerospace & Defense/Advanced Protective Materials & Wearable PPE

Authors

Ting-Wei Liu

Fabio Semperlotti

Further information

Parag Vasekar

psvasekar@prf.org

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-Biomedical devices

-Microfluidic devices

-Energy harvesting devices

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Intellectual Property:

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Keywords: Acoustics, sound control, acoustic waves, noise control, vibration control, acoustic material, elastic wave propagation, energy harvesting, biomedical devices, microfluidic devices