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Anisotropic metamaterials for full control of acoustic waves

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Anisotropic metamaterials for full control of acoustic waves

We show that a holey anisotropic metamaterial can exert subwavelength control over sound waves beyond that achieved with naturally occurring materials [1]. We predict that, for appropriate choices of geometrical parameters, these metamaterials support negative refraction, backward wave propagation along a direction opposite with respect to the acoustic energy flow, and subwavelength imaging [2] with both the source and the image situated far from the material. Acoustic subwavelength control can be advantageous for (bio-)medical ultrasonography and diagnostic imaging, acoustouflidic steering of microparticles and microorganisms, and sonochemistry enhanced by sound focusing

[1] - J. Christensen et al., Nature Phys. 3, 851 (2007)

[2] - J. Zhu, J. Christensen, J. Jung, L. Martin-Moreno, X. Yin, L. Fok, X. Zhang, and F. J. Garcia-Vidal, Nat. Phys. 7, 52 (2011)