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## Fluid-like Elasticity Induced by Anisotropic Effective Mass Density

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**Abstract**— We present a three-dimensional anisotropic elastic metamaterial, which can generate dipolar resonances. Repeating these subwavelength units can lead to one-dimensional arrays, which are essentially elastic rods that can withstand both longitudinal, and flexural vibrations. Band structure analysis shows the systems can have distinctive responses to waves with each polarization. In particular, we demonstrate that only longitudinal wave can propagate within a finite frequency regime, whereas transverse (flexural) waves meet a bandgap — a property conventionally found only in fluids. Effective medium calculation reveals that the indefinite effective mass density (positive along one spatial direction, but negative along another) is responsible to this exotic behavior. Experiments show good agreement with theoretical predictions and simulations. Our findings can see applications in many scenarios such as civil engineering and seismic wave control.