Angular momentum and chirality of phonons

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The concept that lattice vibrations can carry angular momentum has recently gained renewed attention, particularly in the context of two-dimensional materials, leading to the introduction of the term chiral phonons [1]. Since then, the study of chiral phonons has rapidly expanded into diverse research areas such as transport phenomena, nonlinear optics, ultrafast dynamics, and magnetism, forming a new interdisciplinary field [2]. Understanding the origins of these phenomena requires a systematic and cross-disciplinary framework.

In this talk, we present our recent experimental observations of chiral phonons in chiral crystals such as α-HgS and tellurium using circularly polarized Raman spectroscopy [3,4]. We also demonstrate Raman optical activity in the ferroaxial compound $NiTiO_3$, which possesses centrosymmetry [5]. These results provide direct evidence of phonon angular momentum and offer new insights into the coupling between lattice vibrations and other degrees of freedom in solids.

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