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Phonon coupling to the Tb spin in multiferroic TbMn2O5[1]
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TbMn2O5 is a representative of a group of multiferroic materials where ferroelectricity is induced by spiral magnetic ordering at low temperatures. These materials demonstrate several weak structural and magnetic transitions reflecting complex interplay between magnetic order and the lattice. Phonons serve as a probe of lattice changes and, via spin- phonon coupling, of magnetic ordering. We measured the reflectivity spectra in a- and b-polarizations of an orthorhombic single crystal. The Tb-dominating phonons are active in both polarizations but only b-polarization shows a magnetic shift below 24 K where Tb moments start to order. We made lattice dynamics calculations using popular GULP program to understand why a particular infrared phonon is strongly coupled to spin ordering.

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