

Rare earth /Manganese dynamical coupling in multiferroic h-HoMnO₃

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In the hexagonal manganites RMnO₃, ferroelectricity and magnetic orders are quite decoupled: the ferroelectricity, with the occurrence of a polarization along the hexagonal axis occurs at much high temperature ($T_C \approx 800\text{K}$) than the ordering of the Mn magnetic moments ($T_N \approx 80\text{K}$). Despite these different energy scales, non negligible coupling between the electric and magnetic degrees of freedom are present, in their static [1] as well as dynamical [2] properties. Among RMnO₃ compounds, HoMnO₃ has probably the most intriguing phase diagram with several spin reorientations as a function of temperature and magnetic field. In this study, we report on the dynamical properties of this compound in the THz range using both electromagnetic waves and neutrons. We bring new insight on the coupling effects between the 3d and 4f elements as well as their lattice surroundings. We will emphasize the role of the magnetic rare earth element and the peculiarities of Ho in the rare earth series.

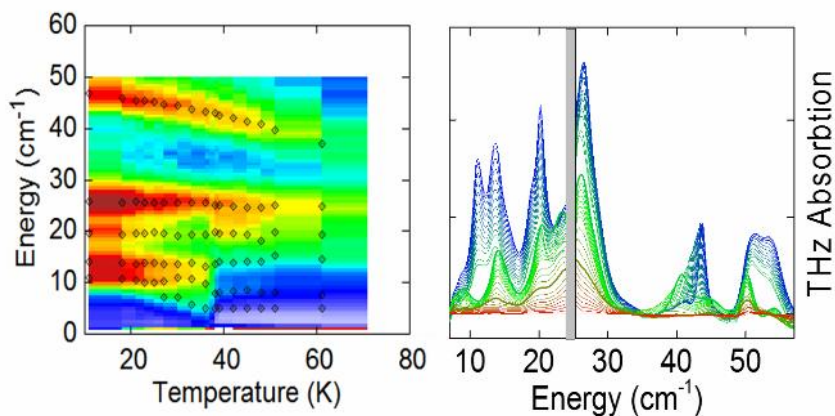


Figure. Inelastic neutron scattering and THz spectroscopy measurements on h-HoMnO₃

References

- [1] X. Fabreges S. Petit, I. Mirebeau, et al, *Phys. Rev. Lett.* 103, 067204 (2009).
- [2] L. Chaix, S. de Brion, S. Petit, et al *Phys. Rev. Lett* 112, 137201 (2014)