



## Mechanisms for Multiferroicity in Rare Earth Orthoferrites: An Overview

Dienstag, 17. September 2024 19:40 (1 h 40m)

Rare earth orthoferrites,  $R\text{FeO}_3$  ( $R$  = rare earth element), have been model systems for studies and theoretical considerations of magnetic structures since the 1960s [Whi69, Mar70, Ber68]. They have regained considerable interest in the last decade due to their complex multiferroic and magnetocaloric properties, which make them potential candidates for modern applications, e.g. in the field of spintronics [Tok12, Lee11].

We have recently completed an extended project, “Mechanisms for multiferroicity in rare earth orthoferrites: Role of the Dzyaloshinskii-Moriya interaction”, funded by the DFG (SA-3688/1-1). In this project we have used various experimental methods, mainly neutron scattering, to obtain an overview of the magnetic interaction parameters, structure and magnetic phase diagrams for different  $R\text{FeO}_3$  compounds. The exchange within the Fe subsystem is the strongest, the Dzyaloshinskii-Moriya interaction leads to a spin canting, the single-ion anisotropy stabilises the system and the exchange interactions of the R-Fe and R-R type lead to a change in the energy balances of the systems, causing spin reorientation transitions. A detailed quantitative study and comparisons with literature data show that the interaction parameters differ significantly between individual members of the  $R\text{FeO}_3$  family [Ovs22a, Ovs22c]. This leads to a fragile balance between the parameters and results in very different magnetic phase diagrams, e.g. for  $\text{HoFeO}_3$ ,  $\text{TbFeO}_3$  and  $\text{YbFeO}_3$  [Ovs22a, Art12, Ovs22c]. We found a new low-symmetry magnetic phase in  $\text{HoFeO}_3$  [Ovs22b], the temperature range of which coincides with the temperatures of a reported large magnetocaloric effect in this compound. In addition, we have also looked at  $\text{TmFeO}_3$ ,  $\text{DyFeO}_3$  and  $\text{LuFeO}_3$  as part of our project and have been able to obtain some initial information for them. In our presentation we give an overview of the results of the orthoferrites we have investigated.

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**Sitzung Einordnung:** Mounting Posters, Beer and light Dinner

**Track Klassifizierung:** Condensed Matter