FB 11 Materialwissenschaft
FG Funktionale Materialien
Prof. Dr. Oliver Gutfleisch
oliver.gutfleisch@tu-darmstadt.de
Peter-Grünberg-Str. 16
64287 Darmstadt
www.mawi.tu-darmstadt.de/fm

Advanced Research Lab / Hiwi / Master thesis

Development of magnetocaloric measurements using pulse magnetic field

The multicaloric effect is described by a temperature or entropy change of a material triggered by external stimuli applied or removed simultaneously or sequentially. The prerequisite for this is a material exhibiting multiple ferroic states. However, direct measurements of the effect are rarely reported. Now, for this reason, we aim at building an in-house measurement device allowing to determine the adiabatic temperature change in pulsed magnetic fields [1].

In this work, we aim at developing a dedicated setup to measure magnetocaloric effect using the pulse magnetometer METIS. The objective is to first characterize the pulse field using a pick-up coil and oscilloscope and then use a thermal sensor to measure the change of temperature of the sample (e.g. Gd) under pulse magnetic field up to 7 T. This is a first step toward the development of a dedicated end-station at European Synchrotron Research Facility to measure novel functional magnetic materials under extreme condition.

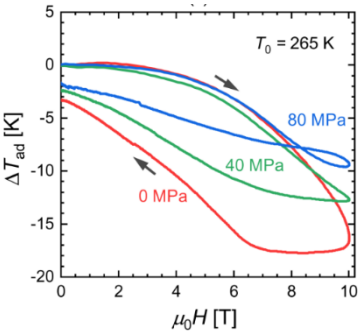

Fig. Magnetic-field-dependent adiabatic temperature change at 265 K for Heusler alloy.

Expertise to be gained:

- Learning about magnetocaloric samples for energy conversion applications
- Learning about instrumentation and development of dedicated measurement station
- Expertise on pulse magnetic field measurement
- Sample preparation and magnetocaloric characterization

[1] Gottschall et al., *J. App. Phys.* (2020) https://doi.org/10.1063/5.0006079

Supervisors: Dr. Alex Aubert, Dr. Konstantin Skokov

Contact: Dr. Sagar Ghorai - sagar.ghorai@tu-darmstadt.de

Bachelor-, ARL and Master-works are always possible in the field of advanced functional magnetic materials:

- *Permanent magnets*
- *Magnetocaloric materials*
- *Magnetic sensors, dampers, actuators*
- *Biomedical application of magnetic particles*