

How fast can we cycle magnetocaloric materials?

Modern society relies on readily available refrigeration. Magnetic refrigeration has three prominent advantages compared to compressor-based refrigeration. First there are no harmful gasses involved, second it may be built more compact as the working material is a solid and third magnetic refrigerators can be very energy-efficient. The efficient coupling between lattice degrees of freedom and spin degrees of freedom in magnetic materials can be used for refrigeration and energy conversion. This coupling is enhanced in materials exhibiting the giant magnetocaloric effect. The cycle frequency of a refrigerator to a large extent shall determine cooling power of the device.

We have a compact magnetometer, which allows fast measurements of magnetization in fields up to 20 T. The equipment is designed to perform fast and accurate measurements in the temperature range from 77 K to 400 K in a 4.5 mm-diameter sample space. This equipment is suited to study the effects of fast magnetizing process on the magnetocaloric properties of materials. In this way we can simulate a fast cycling magnetocaloric device and predict the performance of the materials in such a device.



20 T pulse field magnetic measurement system

The student working on this project should have some affinity to solid state physics and hands on experimental work. Contact Ekkes Brück e.h.bruck@tudelft.nl or Francois Guillou F.Guillou@tudelft.nl