Technische Universität Braunschweig

Study or Master Thesis

(English)
Investigation of a magnetocaloric cooler based on 2D conductive materials

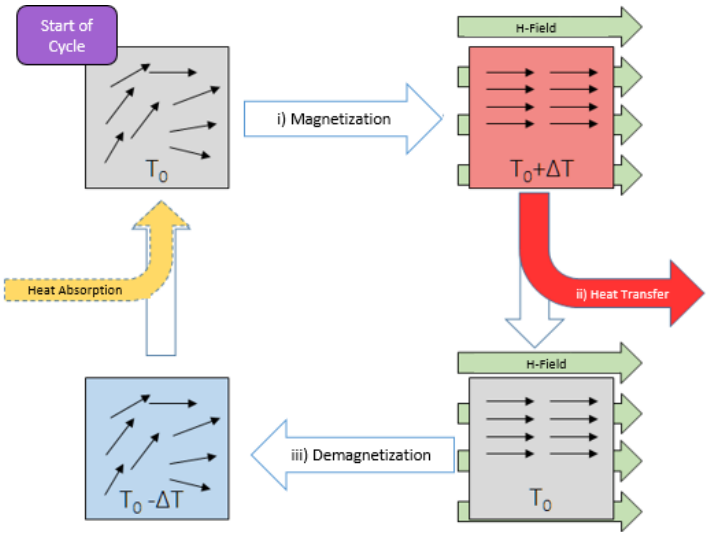

Fig 1: Functional principle of a magneto-caloric cooler

Magneto-caloric cooling systems are based on a ferromagnetic solid (e.g., Gadolinium), which increases its temperature during adiabatic magnetisation. These systems can be realized without cooling liquid and enable simple and compact designs. They can therefore be used to actively cool hot spots in satellites. The disadvantage of liquid-free magneto-caloric coolers is that they rely on heat conductance to transport heat through the cooler. This results in a much lower cooling performance compared to liquid-based systems.

Possible solutions to this problem are novel 2D materials like graphene and carbon nanotubes. Such structured 2D materials have high thermal conductivity so that they have the potential to transport similar amounts of heat as liquid based systems for a given temperature difference.

In this thesis a liquid-free magneto-caloric cooler with 2D structured materials shall be investigated through thermal simulation. The aim is to assess the potential improvement of the cooling performance through the use of the highly thermally conductive solid materials.

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