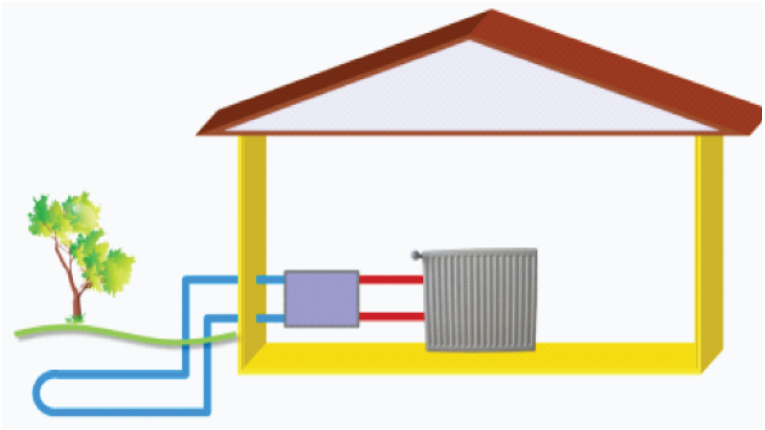

EnovHeat

Energy efficient heat pumps will play a crucial role in the future sustainable energy system. The overall goal of the present project is to develop the scientific and technological foundation for high efficiency heat pumps using magnetocaloric technology.

The refrigerant in such a device is a solid magnetic material whose temperature increases when magnetised and decreases when demagnetised. The use of solid-state active regenerator technology has several advantages compared to traditional vapour-compression heat pumps, including high energy efficiency, quiet operation, and a lack of toxic or greenhouse contributing gases. Also, the heat transfer fluid within the device can be pumped throughout the entire circuit, obviating the need for the secondary circuits and associated heat exchangers and pumps found in conventional “ground source” heat pumps.

However, if magnetocaloric heat pumps are to be realised, a number of issues must be solved, drawing on a complex interplay between several scientific fields. The key scientific challenges will be characterisation and optimisation of materials for use in the device, development of novel algorithms for modelling optimal hybrid magnet designs combining permanent magnets and electromagnets, as well as efficient regenerator design for high heat transfer performance with low pressure. Optimal system operation and integration into buildings will also be addressed.

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Research partners:
DTU Energy Conversion
Christian Bahl, Kurt Engelbrecht , Anders Smith, Kaspar Nielsen , Rasmus Bjørk, Nini Pryds

University of Southern Denmark
Christian Veje

Aalborg University
Per Heiselberg

Imperial College London
Karl Sandeman, Lesley Cohen

University of Ljubljana
Andrej Kitanovski, Jaka Tusek

University of Wisconsin-Madison
Greg Nellis

Other partners:
Technoflex
Jens Mortensen, Jens Nymand

Alpcon
Paw Mortensen, Ali Enkeshafi

Vacuumschmelze
Matthias Katter, Alexander Barcza

BSH Bosch und Siemens Hausge
Kai Nitschmann

The Danish Council for Strategic Research

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University of Southern Denmark