

PhD in materials research in magnetocaloric materials for high efficiency refrigeration

A PhD fellowship on experimental characterization and numerical modeling of magnetocaloric materials is now available at the Department of Energy Conversion and Storage, Technical University of Denmark.

This PhD position at DTU Energy will constitute the major part of a unique research project where we want to perform state-of-the-art in-situ experimental measurements of the most advanced magnetocaloric materials available and compare these to state-of-the-art numerical modelling tools also developed in the project. Currently, there is a significant discrepancy between measured properties and predictions by fundamental models; the measured properties are seen to be significantly weakened compared to those predicted by basic theory. In the project, advanced experiments available at DTU and at least two international partners (Imperial College London and Ames Laboratory, USA) will be conducted and subsequently compared with a state-of-the-art numerical modelling tool that embraces all the ongoing physics in these materials under dynamic conditions.

It will be the task of the PhD student to develop a high-resolution (both in time and space) infra-red measurement technique as a unique characterization tool at DTU Energy and use this together with several other unique techniques available to the project from the above-mentioned partners. These techniques include localized scanning Hall-probe imaging, micro-calorimetry and in-field XRD. The PhD student is therefore expected to spend between three and six months abroad in total visiting these laboratories.

This PhD position is a unique opportunity to get to work on and, in particular, develop cutting edge advanced characterization techniques while at the same time making an extremely important contribution to a promising research field on energy and environmentally friendly refrigeration technology based on solid-state refrigerants. Our research group is well-known for our outstanding numerical modelling tools developed over the past decade as well as our world-leading experimental techniques within multi-caloric materials research.

At the end of the PhD project we will hopefully have developed a theory for the finer mechanisms of bulk magnetocaloric materials and be able to point industry and other interested parties to the focus areas on the further development of high-end magnetocaloric materials. The main activity will take place at the Department of Energy Conversion and Storage at DTU Risø Campus.

Qualifications

Candidates should be highly motivated and must hold a master degree (or equivalent), preferably in a physics, engineering, chemistry or a materials science-related discipline.

Further qualifications:

- Solid laboratory skills for using characterization equipment

- Good understanding of realizing experimental setups
- Good communication skills in English
- Being able to work independently and in a team

Candidates with the following qualifications are preferred

- Experience in numerical modeling
- Experience with XRD and/or other materials characterization techniques
- Experience with developing experimental setups and Labview or similar programs
- Experience with Matlab or similar software
- Experience with handling experimental data and data processing

Salary and appointment terms

The salary and appointment terms are consistent with the current rules for PhD students. The period of employment is 3 years.

The expected starting date is October 2017.

Further information

Please contact associate professor Kaspar K. Nielsen, kaki@dtu.dk, associate professor Rasmus Bjørk, rabj@dtu.dk, or senior researcher Christian Bahl, chr@dtu.dk, for further information.

Please do not send applications to this e-mail address, instead apply online as described below.

Application

Applications must be submitted as **one pdf file** containing all materials to be given consideration. To apply, please open the link "Apply online," fill in the online application form, and attach **all your materials in English in one pdf file**. The file must include:

- A letter motivating the application (cover letter)
- Curriculum vitae
- Grade transcripts and BSc/MSc diploma
- Excel sheet with translation of grades to the Danish grading system (see guidelines and [excel spreadsheet here](#))

All interested candidates irrespective of age, gender, race, disability, religion or ethnic background are encouraged to apply.

DTU Energy is focusing on functional materials and their application in sustainable energy technology. Our research areas include fuel cells, electrolysis, solar cells, magnetic refrigeration, superconductivity and thermoelectrics. Additional information about the department can be found on www.ecs.dtu.dk

DTU is a technical university providing internationally leading research, education, innovation and public service. Our staff of 5,000 advance science and technology to create innovative solutions that meet the demands of society; and our 9,000 students are educated to address the technological

challenges of the future. DTU is an independent academic university collaborating globally with business, industry, government, and public agencies.