



The Institute of Functional Materials headed by Prof. O. Gutfleisch at the department for Materials and Geosciences at Technical University Darmstadt is offering a position as

Research Assistant / Ph.D. (all genders) – Direct microstructure and magnetic design of magnetic shape memory alloys for multicaloric solid-state cooling – 75%

with a fixed-term contract of 3 years. The position is classified according to pay group 13 of the TU Darmstadt collective agreement (TV-TU Darmstadt).

The position is within a bilateral collaborative project between the Functional Materials Group, TU Darmstadt and the Institute of Materials Engineering, University of Kassel. The aim of the project is the direct microstructure and magnetic design of Ni-(Co)-Mn-Sn Heusler shape memory alloys for multicaloric solid-state cooling using Direct Energy Deposition (DED) Additive Manufacturing (AM) techniques.

Magneto- and multicaloric materials are attracting a lot of attention for their use in solid-state cooling, a more energy efficient and environmentally friendly technique than the current vapor compression technology. Research into more energy-efficient cooling technology is essential as cooling applications account for approximately 20% of the world's electricity demand and 8% of greenhouse gas emissions, and demand is increasing worldwide. The Ni-Mn based Heusler alloys exhibit a large magneto and elastocaloric effect at the first order magneto-structural transition. While the transition temperature can be varied by chemical composition, the mechanical stability is strongly dependent on the microstructure.

The position is hosted by the internationally renowned Functional Materials Group, which focuses on the development of resource-efficient functional materials. In our research, we investigate several magnetocaloric and multicaloric materials for their caloric performance including the secondary functionalities such as mechanical stability, cyclic performance, criticality, and non-toxicity. In addition, we use various scalable processing techniques, including AM techniques for microstructure design and processing of geometrically complex magnetocaloric regenerators with optimized thermal exchange properties. Our research contributes to the development of magnetocaloric and multicaloric materials from fundamental mechanism to application. Further topics of the research group are: permanent magnets, magnetocaloric materials for hydrogen liquefaction, magnetic materials for biomedical and catalytic applications with a focus on synthesis, AM, characterization and modeling of magnetic, thermal and (micro-)structural properties.

Your tasks within the project will be the chemical, magnetic, caloric characterization and in-situ optical microscopy of the transformation process in Ni-(Co)-Mn-Sn Heusler alloys. The specimens will be processed by AM DED in Kassel, while AM by Laser Powder Bed Fusion (PBF-LM) will be available at TU Darmstadt. During the bilateral project there will be a close cooperation with our partner in Kassel. Especially regarding AM processing and thermo-mechanical testing of the samples, bilateral exchange and joint analysis will be performed at both universities. The results will be presented in international scientific journals and conferences as well as in regular project meetings.

Your profile:

Requirements are an excellent university scientific degree (master or comparable) in Materials Science, Physics or Chemistry. Ideally you have some experience with synthesis and characterization of metallic or even magnetic materials. You have very good English (fluent in spoken and written) and communication skills. We expect you to integrate into our interdisciplinary team and contribute actively to the overall progress of the project's objectives in close collaboration with our colleagues at the University of Kassel while, at the same time, pursuing your own thesis highly motivated and self-reliantly. You are highly motivated to publish your results, present them at international project meetings and conferences. You bring excellent communication skills and enjoy working in interdisciplinary and international teams.

We offer:

The opportunity to work towards a PhD degree on a cutting-edge research topic in the field of AM and functional materials for energy conversion. We offer excellent working conditions in an international team with integration into a scientific network of well-renowned experts of the magnetic materials community. The Technical University of Darmstadt offers a varied, diverse working environment, independent work, demand-oriented training opportunities and individual personnel development.

Mobile working, company health management and the compatibility of family and career are a matter of course. In addition, you will receive free travel authorization for local and regional transport in the area of the state of Hesse (LandesTicket Hessen) according to the applicable regulations. All university employees can use the offer of deferred compensation in favor of a "Job Rad" leasing model.

Opportunity for further qualification (doctoral dissertation) is given. The fulfillment of the duties likewise enables the scientific qualifications of the candidate.

Technical University of Darmstadt intends to increase the number of female employees and encourages female candidates to apply. In case of equal qualifications applicants with a degree of disability of at least 50 or equal will be given preference.

Applications (all in a single PDF-file) should be sent including all usual documents, stating the above identification number, in the form of a pdf by e-mail to info@fm.tu-darmstadt.de. If you have any questions, please contact Dr. Franziska Scheibel (franziska.scheibel@tu-darmstadt.de) or Prof. Oliver Gutfleisch (oliver.gutfleisch@tu-darmstadt.de).

For the website of the FM group, see → www.mawi.tu-darmstadt.de/fm.

By submitting your application, you agree that your data may be stored and processed for the purpose of filling the vacancy. You can find our → [privacy policy](#) on our webpage.

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