



The Functional Materials group headed by Prof. O. Gutfleisch at the Department of Materials and Earth Science at Technical University Darmstadt is offering a

## **Research Assistant / PhD (all genders) – Reversible Tuning of Magnetism and Electronic Properties in Rare Earth-Transition Metal Thin Films by Small Voltages – 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 available immediately. It is hosted by the internationally renowned group Functional Materials, which focuses on the development of novel and resource-efficient functional materials. The group's topics of interest range from permanent magnets over magnetocaloric materials and ferromagnetic shape-memory alloys to magnetic materials with large anomalous Hall and Nernst effect for application with focus on synthesis, characterization and modeling of the magnetic, thermal and (micro-)structural properties.

We are looking for highly-motivated, excellent applicant for exploring the voltage-tuning of magnetism and electronic properties in thin films, with possible extension to bulk materials. In this project, we aim to demonstrate that magnetic anisotropy and coercivity of rare earth-transition metal thin films can be controlled in fast and fully reversible over significant magnitudes in small voltages. We will further investigate the reversible modulation of anomalous Hall effect (AHE) and anomalous Nernst effect by applying voltages. This work will significantly deepen our understanding of the mechanisms behind magnetism and electron transport in rare earth-transition metal alloys and lead to the development of a new class of magnetic materials truly beyond field-effect devices, for instance voltage-assisted magnetic recording and neuromorphic computing.

### **Your tasks:**

You will prepare thin films of lanthanide-transition metal alloys both in epitaxial and polycrystalline forms. A systematic characterization of their microstructure, magnetic and electronic properties will be carried out with many in-house experimental techniques. This includes the purpose-built in-situ SQUID and in-situ AHE devices allowing dynamic monitoring of how magnetism and electron transport properties change. The goal is the realization of voltage-controlled magnetic materials with adaptive magnetic and physical properties on demand.

### **Your profile:**

We expect you to have a strong interest to explore magnetism and electronic properties in thin films of rare earth-transition metal alloys. How their physical properties respond to external voltages represents the major pursuit of this work. You should be highly motivated and pursue your own thesis self-reliantly and with great curiosity. Requirements are an excellent scientific degree (master or comparable) in materials science or condensed matter physics, high ability to acquire knowledge fast and existing excellent English competencies. Hands-on experiences on growth of thin films by magnetron sputtering and measurements of physical properties would be desirable. You are expected to publish your results and present them at international conferences. 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 your colleagues.

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

The Technische Universität 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 with the usual documents, stating the above identification number, in the form of a pdf by e-mail to [info@fm.tu-darmstadt.de](mailto:info@fm.tu-darmstadt.de). If you have any questions, please contact Dr. Xinglong Ye ([xinglong.ye@tu-darmstadt.de](mailto:xinglong.ye@tu-darmstadt.de)) or Prof. Oliver Gutfleisch ([oliver.gutfleisch@tu-darmstadt.de](mailto:oliver.gutfleisch@tu-darmstadt.de)).

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.

## **Code No. 842**

Published on February 27, 2024

Application deadline March 26, 2024