

Helmholtz-Zentrum Dresden-Rossendorf e.V.



With cutting-edge research in the fields of ENERGY, HEALTH and MATTER, around 1,500 employees from more than 70 nations at Helmholtz-Zentrum Dresden-Rossendorf (HZDR) are committed to mastering the great challenges facing society today. The Institute for Resource Ecology (IRE) conducts applied basic research into the protection of people and the environment from the effects of radioactive radiation. The Department of Structural Materials is looking for a

Postdoc (f/m/d) Mechanical Characterization and Materials Assessment for Nuclear Applications

Small specimen techniques have evolved from a pragmatic response to limited material availability into a methodological tool in their own right, one that enables higher statistical sampling within a given material condition, new specimen configurations, and direct access to materials that simply do not exist in conventional quantities. This makes them relevant to two central challenges in nuclear materials research: the reliable assessment of irradiation-induced property changes in operating installations and the systematic screening of new alloy concepts at early development stages where only small material volumes are available. The Structural Materials Department has developed and operated such techniques for a number of years within national and European research programs, including fracture mechanics characterization using miniaturized specimen geometries and Small Punch Testing. The department is embedded in Euratom-funded consortia addressing both the long-term integrity of reactor pressure vessel steels and the qualification of candidate materials for advanced reactor concepts. Experimental work with neutron-irradiated material is carried out in hot cell facilities, infrastructure that only a small number of research groups worldwide can offer at this level. This position brings these activities together and aims to advance them scientifically. We are looking for someone with genuine research drive who takes ownership of testing programs, thinks critically about methods, and builds the analytical frameworks needed to connect small specimen results to established fracture mechanics assessment approaches. A concrete starting point is existing work in the department on the systematic correlation of fractographic observations with microstructural features, aimed at understanding how neutron irradiation modifies fracture initiation behavior at the microstructural level and what this means for the interpretation of macromechanical test data. Numerical methods, in particular FEM-based stress analysis at initiation sites within the framework of local fracture approaches, provide a natural bridge between experiment and mechanistic understanding. Data-driven methods, for instance for inverse parameter identification or uncertainty quantification in fracture mechanics datasets, are not an end in themselves, but a compelling extension where they offer real scientific insight. The position offers the scope to pursue these directions and the backing of an active international research network. The department is increasingly engaged in research programs on advanced reactor systems including fusion, a field where the demand for robust materials assessment methods is clearly growing.

City: Dresden; Starting date (earliest): 01/11/26; Remuneration: TVöD-Bund; Reference number: 2026/100; Closing date: 16/08/26

Tasks

- Coordination and scientific oversight of mechanical testing programs for nuclear structural materials - including fracture mechanics characterization, small specimen testing and tensile testing - within ongoing and upcoming collaborative projects
- Critical assessment and further development of small specimen methods with regard to their reliability and transferability to standard fracture mechanics parameters
- Systematic correlation of fractographic observations with microstructural features and macromechanical test results
- Finite element simulation of mechanical tests, in particular for stress analysis at fracture initiation sites in the context of local fracture approaches
- Documentation, analysis and publication of results in peer-reviewed journals and at international conferences

Requirements

- Completed PhD in Materials Science, Physics, Materials Engineering, Nuclear Engineering, or a related field
- Strong background in the mechanical behavior and fracture mechanics of metallic materials
- Experience with finite element modelling, in particular in the context of mechanical testing or local approaches to fracture, is an advantage
- Practical experience in mechanical testing, preferably fracture mechanics and/or small specimen techniques, is an advantage
- Interest in the methodological development and advancement of testing procedures
- Knowledge of nuclear structural materials is an advantage
- Experience in fractographic or microstructural characterization is an advantage
- Familiarity with scientific data analysis environments
- Sound knowledge of quantitative data analysis and statistical methods
- Interest in or initial experience with data-driven methods or machine learning is an advantage
- Strong communication skills and a collaborative approach to working with internal and external partners
- Independent, structured and solution-oriented way of working
- Initiative and genuine interest in shaping scientific questions, not just answering them
- Ability to work effectively in international research consortia
- Programming skills in Python and/or C/C++
- Excellent written and spoken English; German is an advantage

What we offer

- A vibrant research community in an open, diverse and international work environment
- Scientific excellence and extensive professional networking opportunities
- Salary and social benefits in accordance with the collective agreement for the

public sector (TVöD-Bund) including 30 days of paid holiday leave, company pension scheme (VBL)

- Depending on the personal qualifications, the candidate may be classified in salary group 13 according to TVöD-Bund
- We support a good work-life balance with the possibility of part-time employment, mobile working and flexible working hours
- Numerous company health management offerings
- Employee discounts with well-known providers via the platform Corporate Benefits
- An employer subsidy for the "Deutschland-Ticket Jobticket"

Application

We look forward to receiving your application documents (including cover letter, CV, diplomas/transcripts, etc.), which you can submit via our online-application-system: <https://www.hzdr.de/db/Cms?pNid=490&pLang=en&pOid=78301>

More information at <https://stellenticket.de/206187/TUBS/>
Offer visible until 16/08/26

