At the University of Bremen, the Center of Applied Space Technology and Microgravity (ZARM) has a vacancy in the Combustion Technology group as part of a research project starting at the earliest possible date as

Research Associate (f/m/d)
(Salary Scale 13 TV-L, 100 %)

on the subject

"Fire safety in human spaceflight

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Pre-Ignition Fire Detection System"

full-time (39.2 hours per week) fixed-term position until June 30, 2028 (in accordance with § 2 WissZeitVG). Part-time work is generally possible. Details are to be agreed with ZARM if necessary.

Project:

Looking ahead to future exploration missions, fire safety plays a major role in human spaceflight. A fire in a spacecraft, lunar base, or habitat is one of the most devastating scenarios imaginable and could not only lead to the failure of a mission or the end of exploration efforts, but also to the loss of human life! It is therefore crucial to detect a potential fire early and reliably so that appropriate firefighting measures can be initiated.

Currently, smoke detectors are primarily used, e.g., on the International Space Station (ISS). These sensors have several disadvantages: (i) they only trigger an alarm when smoke has already developed, i.e., when the fire is already there, (ii) the placement of these sensors is very difficult because, under reduced gravity, there is no preferred direction in which hot smoke gases collect, and (iii) smoke detectors are very sensitive to dust particles (including moon dust), which can lead to false alarms. We are therefore pursuing a different approach. By using SMOX sensors (sensors based on metal oxide semiconductors), which are very sensitive to the smallest changes in atmospheric composition, thermally driven outgassing in very low concentrations can be measured by a resistance change in the sensor. This allows material overheating to be detected even before a flame develops.

Building on the results of the previous project phase, in which the described concept was successfully demonstrated using four materials, the system will now be further developed and a demonstrator manufactured. The focus here is on the detection of overheated cable insulation used in human-ratep space systems. In addition, scaling options are to be investigated to test the applicability in real space systems under reduced gravity. Numerical simulations are to be used for this purpose.

The project is funded by the Federal Ministry of Research, Technology, and Space (BMFTR) and supervised by the German Space Agency at the DLR. It is part of a joint project with partners at the University of Bremen and the University of Tübingen, as well as the space company ZARM Technik AG. In addition, opportunities are being explored to test the measurement principle on spacecraft in orbit.

Tasks:

- Development of a numerical model for simulating gas transport in space systems
- Conducting experiments on outgassing and gas transport
- Scientific evaluation of the experiments
- Comparison of experimental results with data from numerical simulations

The first phase involves familiarization with the research question and selection of the simulation software. Initial promising results have been generated using OpenFOAM. The main task then is to develop the numerical model and validate it with experiments. The working group also has two technical staff members available to provide support for any necessary design or electronic work. In addition, there is close cooperation with the partners in the joint project. The progress of the project and the scientific findings obtained are presented at technical conferences and prepared for scientific publications.

What you can expect:

- Independent work in an interdisciplinary team in which cooperation and mutual support are very important
- A wide range of opportunities to help shape the research field
- Participation in (inter)national conferences and summer schools

Requirements:

A university degree in engineering or physics (master's or university diploma) is required. Applicants who are in the final phase of their master's degree will also be considered. Please note that the master's degree certificate must be submitted in order to be hired.

Applicants are expected to have a good technical understanding and the ability to work independently in a small team. In addition, strong English skills are required. Basic knowledge in the field of computational fluid dynamics (CFD) would be desirable. The wish to do a PhD in the context of the project will be supported if suitable.

Notice:

Open to unconventional approaches in research and teaching, the University of Bremen has retained its character as a place of short distances for people and ideas since it was founded 50 years ago. With a broad range of subjects, we combine exceptional performance with great potential for innovation. As an ambitious research university, we stand for the approach of research-based learning and a pronounced orientation towards interdisciplinarity. We actively organize scientific cooperation worldwide in a spirit of partnership.

Today, around 23,000 people learn, teach, research and work on our international campus. In research and teaching, administration and operations, we are firmly committed to the goals of sustainability, climate justice, and climate neutrality. Our Bremen spirit is expressed in the courage to try new things, in supportive cooperation, in respect, and appreciation for one another. With our study and research profile and as part of the European YUFE network, we assume social responsibility in the region, in Europe and the world.

The university is family-friendly, diverse, and sees itself as an international university. We therefore welcome all applicants regardless of gender, nationality, ethnic and social origin, religion/belief, disability, age, sexual orientation, and identity.

The University of Bremen intends to increase the proportion of female employees in academia, which is why women are expressly encouraged to apply. Women with equal qualifications will be given priority unless there are compelling reasons to favor a male applicant. Severely disabled applicants will be given priority if they have essentially the same professional and personal qualifications.

For general questions about the recruitment process and questions about the content of the advertised position, please contact: florian.meyer@zarm.uni-bremen.de

Application:

Please send your application (motivation letter, CV, certificates, list of publications if applicable) with the **reference number A180-25** by **July 17th, 2025** as a PDF file by unencrypted electronic mail to: florian.meyer@zarm.uni-bremen.de

or by regular mail to

University of Bremen
ZARM
Dr.-Ing. Florian Meyer
Am Fallturm 2
28359 Bremen
GERMANY

We would like to point out that no photos are to be attached to the application documents.

Please only send us copies of your application documents (no folders) as we cannot return them. They will be destroyed after the selection process has been completed. Any costs for the application procedure cannot be reimbursed.