

**Bachelor's/Master's thesis topics:**

**Characterisation of functionally graded tungsten/steel protective coatings**

**We are offering opportunities for Bachelor's or Master's theses within the following research field:**

At the Institute for Applied Materials, Materials and Biomechanics, we are developing protective coatings for the first wall of future fusion power plants. The wall needs to be protected from erosion caused by high-energy particles from the fusion plasma. On top of that, the wall needs to survive peak thermal loads. To this end, the steel surface of the wall is coated with tungsten. Normally, the difference in thermal expansion coefficient between tungsten and steel would cause the coating to spall off. This can be compensated by using a functionally graded material: the use of several coating layers with increasing tungsten/steel ratio. We create these coatings with vacuum plasma spraying. The coatings need to be characterised with regard to coating quality, microstructure, bonding strength, thermal fatigue behaviour and mechanical properties. The results are used for further optimisation of the coating process. For example, the steel parts need to be checked for potential overheating during coating (hardness, grain size) to adapt the processing temperature. In order to further develop the coatings and to establish construction guidelines for future components the coating properties need to be characterised precisely. This includes, for example, the measurement of thermo-mechanical material properties.

This research field offers multiple topics for Bachelor's or Master's theses.

Please do not hesitate to contact us!

We are offering personal supervision, compliant with Covid-19. You will find the opportunity to gain hands-on experience on modern methods of materials characterisation, always with the possibility to refer to friendly, experienced contact partners. You will gain insight into up-to-date coating technology as well as the young field of functionally graded materials, which offers many possibilities and challenges to engineering.

## **Requirements**

- You are currently studying materials science and engineering, mechanical engineering, production engineering, mineralogy or a related field
- Ideally you should have gained first experience in mechanical materials characterisation, metallography or microstructure analysis
- You are interested in materials science and its analysis methods and are eager to dig into new, challenging fields

## **Organisational unit**

Institute for Applied Materials, Materials and Biomechanics, Mechanics of Materials 2

## **Starting date and specification of your task**

No fixed date. Please do contact us to discuss your task and to find a starting date.

## **Application deadline**

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## **Contact person**

For further information, please contact Dr.-Ing. Thilo Grammes ( [thilo.grammes@kit.edu](mailto:thilo.grammes@kit.edu), phone +49 721/608-22946 ) or Prof. Dr.-Ing. Jarir Aktaa ( [jarir.aktaa@kit.edu](mailto:jarir.aktaa@kit.edu), phone +49 721/608-24946 ).