In a dynamic and international work environment we develop at the Institute of Energy and Climate Research - Materials Synthesis and Processing (IEK-1) materials and components for highly efficient future energy conversion and storage systems (in particular, oxide ceramic fuel cells, solid-state batteries, thermal barrier coatings for gas turbines and gas separation membranes). The main focus is put on inorganic materials which are processed as functional layers via gas phase or powder deposition. Our core competences allow for a rapid transfer of scientific results for industrial implementation, contributing to the solution of one of the great societal challenges of our time.

We offer a

Master thesis: Development of innovative double-layer Gd2Zr2O7/YSZ thermal barrier coating systems for load-flexible and high-temperature applications in gas turbines

Your Job:
In the project supported by the MatKat foundation, an innovative double-layer thermal barrier coating system made of Gd2Zr2O7 and YSZ is being developed for use in stationary gas turbines. In the master thesis, the pyrochlore coating is to be optimized to withstand high operating temperatures in the turbine as well as to enable a load-flexible operation of the turbine. In this case, the process-dependent microstructure of the coating is of major importance, as it influences the thermal insulating effect of the coating. In addition, it also affects the tolerance of the coating to stresses arising from thermal expansion mismatch. Enhanced application temperatures allow either an increase in turbine efficiency or the addition of green-produced hydrogen to the combustion process, whichcombusts much hotter than natural gas. Both alternatives
help reduce CO2 emissions during electricity production with gas turbines. The additional increased load flexibility of the thermal barrier coating system makes it possible to compensate the fluctuations in the energy supply to the power grid caused by renewable energies.

Your tasks will mainly include the
• Production of different layer microstructures by parameter variations in the manufacturing process
• Evaluation of the microstructural properties in the initial state as well as after thermal cycling
• Analysis of the lifetime of the coating systems in thermal cycling tests at different application temperatures.

Your Profile:
• Master’s program in the field of engineering, materials science, chemistry, physics, or similar in progress
• Initial knowledge of inorganic non-metallic materials as well as the production of functional coatings is preferred
• Practical skills and interest in laboratory work
• High degree of initiative and enjoyment of independent work
• Strong communication and teamwork skills
• Very good knowledge of German and English (written and spoken)

Our Offer:
We work on the very latest issues that impact our society and are offering you the chance to actively help in shaping the change! We support you in your work with:
• Here, you can note any specifics that apply to the vacancy
• An interesting and socially relevant topic for your thesis with future-oriented themes
• Ideal conditions for gaining practical experience alongside your studies
• An interdisciplinary collaboration on projects in an international, committed and collegial team
• Excellent technical equipment and the newest technology
• Qualified support through your scientific colleagues
• The chance to independently prepare and work on your tasks
• Flexible working hours as well as a reasonable remuneration
• A large research campus with green spaces, offering the best possible means for networking with colleagues and pursuing sports alongside work The position is initially for a fixed term of 6 months.

Forschungszentrum Jülich promotes equal opportunities and diversity in its employment relations. We also welcome applications from disabled persons.