



## **PhD or Postdoc Position in Materials Engineering**

**Department of Materials Science**

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## **Joining of Single Crystal Ni-base Superalloys by Transient Liquid Phase Diffusion Brazing**

### Project Description

According to the prediction of energy experts, large new power generation capacities will be needed by 2010 in Germany and Europe. Three reasons lead to this demand: Many fossil fired power plants will be reaching the end of their technical lifetime, nuclear power plants installed in Germany will be shut down in the same period and the demand for electricity will further increase. As a result of these trends, a large demand for new fossil fired power plants will arise within in the next twenty years. New power plant capacities will have to be constructed under the current political and economic conditions which include the liberalized electricity markets, growing international competition as well as national and international

commitments to a reduction of greenhouse gases. In order to preserve natural resources and to reduce CO<sub>2</sub>-emissions, only most efficient plants will be allowed to be constructed. These requirements were drawn up by an initiative called COORETEC (**CO<sub>2</sub>-Reduction-Technologies** for fossil fuelled power plants) which consists of high level experts from German research and industry.

Before this background there are activities to replace the current monolithic turbine blades by a modular design to achieve advantages in design flexibility, manufacturing, serviceability and in increased part lifetime. To support the development of components manufactured in a modular fashion, techniques have to be developed that allow the joining of various Ni base superalloys.

In this project the WTM institute is responsible for developing a brazing technology for joining directionally solidified and single crystal turbine blades. The starting point of the work is a patented transient liquid phase diffusion brazing process based on a new melting point depressant that has been identified in a previous project. The task is to optimise the technique for wider brazing gaps. Modelling shall accompany the experimental work to further our understanding of occurring defects, such as decomposition of the solid solution matrix and recrystallisation.

### Requirements

Superior graduation (Dipl.-Ing., M. Sc. or PhD) in Materials Science or similar.

### Contact

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### Erlangen

Erlangen is Bavaria's eighth-largest city, with a little over 100,000 inhabitants. Its social infrastructure provides a wide range of opportunities. Erlangen is first mentioned in documents dating from 1002, but its real history began with the influx of Huguenot refugees from France in 1686. The town was specially rebuilt for the Huguenot settlers, and that original layout and that essential architectural concept can be seen to this day.

In the wider world, Erlangen is also renowned both as home to the second largest university in Bavaria, which is home itself to a highly regarded Faculty of Engineering, and as the original home of Siemens AG which still maintains a substantial presence in the city.

The student population of Erlangen and Nuremberg, which numbers just over 21,000, lives full of hustle and bustle. Although the inhabitants of Erlangen numbered a mere 30,000 by the end of World War II, the move of the central administration of the Siemens-Schuckert concern from Berlin to Erlangen in 1948 saw a rapid increase in the population of the former Huguenot town. The city of Erlangen, which is committed to its motto "Open by Tradition" because of its granting of religious asylum to Huguenot refugees, still retains a number of popular customs. Notable amongst these are the so-called "Erlanger Bergkirchweih", a beer festival which takes place each Whitsun on the Burgberg, and the University Garden Party, one of the largest of its kind in Europe and a highlight of the social calendar. Visitors from across the globe enjoy the wide variety of cultural activities offered in Erlangen and

Nuremberg, including the Comic Salon, the Puppet Theatre Festival, the International Week of the Young Theatre ARENA and the International Literature Conference Interlit, known to insiders as the literature world's answer to the Documenta, the well-known avant-garde visual arts exhibition in Kassel. In the course of the last few years Erlangen has also earned the title "Green Capital of Germany" as a result of its commitment to ecological and environmental issues. And it is also well-known beyond the borders of the Federal Republic as a bicycle-friendly city, with 90,000 bicycles owned by its 100,000 inhabitants.

Popular destinations await the holiday-maker and day-tripper only a few kilometers beyond the Nuremberg-Fuerth-Erlangen conurbation. Little Switzerland, as it is known, is above all a paradise for hikers and climbers, whilst the lowland plains of Franconia, with their lakes, are an El Dorado for water-sport fanatics.

The words which Johann Michael Füssel used in 1788 to describe Erlangen and its surrounding areas in his travel journal are still apt today: "One lacks for nothing hereabouts, whether in need of beneficial and charitable institutions or in pursuit of the opportunity to deepen one's knowledge of and take delight in the sciences, the arts and the customs of the local people."