



Research Assistant (Ph.D. position)

Description

Research at the Institute for Combustion Technology at the University of Stuttgart focuses on theory and computation of turbulent multiphase flows. The key expertise of our work is the modelling of multiscale processes and the corresponding interactions between turbulence, chemistry and particle dynamics. Examples include specific combustion related issues like turbulent combustion, solid fuel combustion and pollutant formation but also nanoparticle flame synthesis, flash boiling and mixing in particle laden flows.

We have a current opening at ITV for a research assistant (Ph.D.) position in the area of “modelling particle flame synthesis”. The aggregation of spherical particles is the major growth process in nature and in industry alike. As examples may serve processes related to flame particle synthesis, to water purification or to the production of pharmaceuticals. Many industrial processes involve not only one substance but a host of materials to improve and/or extend the products’ functionalities such as palladium catalysts where addition of gold particles significantly increases the catalysts’ selectivity. Multiple materials typically feature different particle sizes that then cause different particle dynamics and aggregation characteristics. Of primary importance are the number of so-called hetero-contacts, i.e. the number of contacts between the different materials, as they determine the product’s performance, and this number can be controlled by process design. The project’s challenge is now the exact characterization, modelling and numerical simulation of the aggregation dynamics in polydisperse systems. The project is part of the newly established priority program SPP2289 “Creation of Synergies in Tailor-made Mixtures of Heterogeneous Powders: Hetero Aggregations of Particulate Systems and Their Properties” where 18 research groups from all parts of Germany collaborate to aid product design of a host of materials with new properties and functions (<https://www.uni-bremen.de/spp2289>)

Your tasks:

- Your tasks will focus on the simulation of aggregation of bi-disperse systems. Collision frequencies and aggregate growth need to be computed and the resulting aggregate structure needs to be characterized.
- You need to develop and implement the corresponding algorithms that can also be used on high performance computing platforms.

- You will analyze the simulation data with the aid of analytical models and machine learning methods. Especially the latter shall help you to identify the key quantities that determine growth and the aggregates' morphologies.
- You will develop new models and closures for the statistical description of the aggregation process such that the models are applicable to processes of industrial interest.
- You will collaborate with the experimental groups conducting related work within the SPP2289, and all results shall be presented at national and international conferences.
- Dissemination of your results in international journals is expected.

Your profile

We expect an excellent Master degree in engineering or related disciplines. You have a solid background in fluid mechanics, thermodynamics, combustion and/or particle technology. You enjoy theory and model development and their numerical implementation. You will have experience in programming (C, C++, Python). Knowledge of OpenFOAM for data generation, its pre- and postprocessing tools and machine learning related software would be beneficial.

You will be an enthusiastic and self-motivated person with a willingness to work closely with other team members. The Institute's scientific language is English, but willingness to study German is expected.

We offer:

- The pay scale is according to TVL-E13. The grade and therefore the final salary will depend on your relevant experience. The original appointment will be for one year. Upon successful completion of the first year, the employment can be extended for a minimum of two further years.
- We offer excellent potential for scientific development in the Institute for Combustion Technology (ITV) at the University of Stuttgart with state-of-the-art computer facilities and access to the University's supercomputing centre.

The University of Stuttgart is one of the leading technically oriented universities in Germany with about 26.000 students and more than 5.000 staff. The Institute for Combustion Technology is part of the Faculty of Energy-, Process- and Bioengineering.

If interested, please send your CV and all other relevant application documents as PDF per email to bewerbungen@itv.uni-stuttgart.de

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