TECHNISCHE UNIVERSITÄT DRESDEN

KTH VETENSKAP OCH KONST

Fakultät Maschinenwesen Institut für Energietechnik, Professur für Technische Thermodynamik

Are you interested in performing your Bachelor/Master/Diploma work at TUD in an exciting subject, practicing your English and in cooperation with a visiting scientist from Sweden?

Possible subjects:

1. Simulation of the chemical reactions involved in the dissociation of carbon dioxide (CO_2) in a plasma: how to simplify the chemistry while still being accurate?
2. Splitting water vapour into hydrogen: modeling the chemical pathways of dissociation of H_2O using plasma
3. Computational fluid dynamic simulation of the mixture of different chemical species in a plasma reactor
4. Using optical spectroscopy to track reactions in a plasma reactor (experimental subject)
5. High speed Schlieren photography in plasma reactors: generating data to validate simulations (experimental subject)

Background:

A shift into a sustainable global economy requires the development of novel, commercially viable technologies to tackle the challenges of a future renewable-based electrical power system. Such a shift should also enable the capture and utilization of greenhouse gases to replace essential hydrocarbon-based chemicals that will continue being used in industry. Plasma-based chemical storage has been recently highlighted as a promising but still widely unexplored technology to tackle these challenges. This new research area at TUD in cooperation with the KTH Royal Institute of Technology, Stockholm, Sweden is aimed at develop, optimize and scale up a plasma-based conversion laboratory prototype to efficiently convert one major greenhouse gase (carbon dioxide CO_2) with water into high-market-value chemicals.

Target:

The overall target of this project is to develop computational models to simulate the dissociation of carbon dioxide and water using plasma technology as well as to execute experiments to validate these models.

Requirements:

Solid background on physics and mathematics. Interest in interdisciplinary work in physics, chemistry and engineering. Commitment in numerical and/or experimental work is expected.

Opportunities:

Working in these projects brings the opportunity to work on a cutting-edge technology for utilization of greenhouse gases to synthesize high value chemicals, a subject of great interest for a sustainable environment and the expansion of renewable energies in the future. The learned knowledge in simulation methods and/or experimental techniques has a broader use, which can be readily applied in any other field (environmental engineering, automotive industry, semiconductor industry, electrotechnical and chemical industry).

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