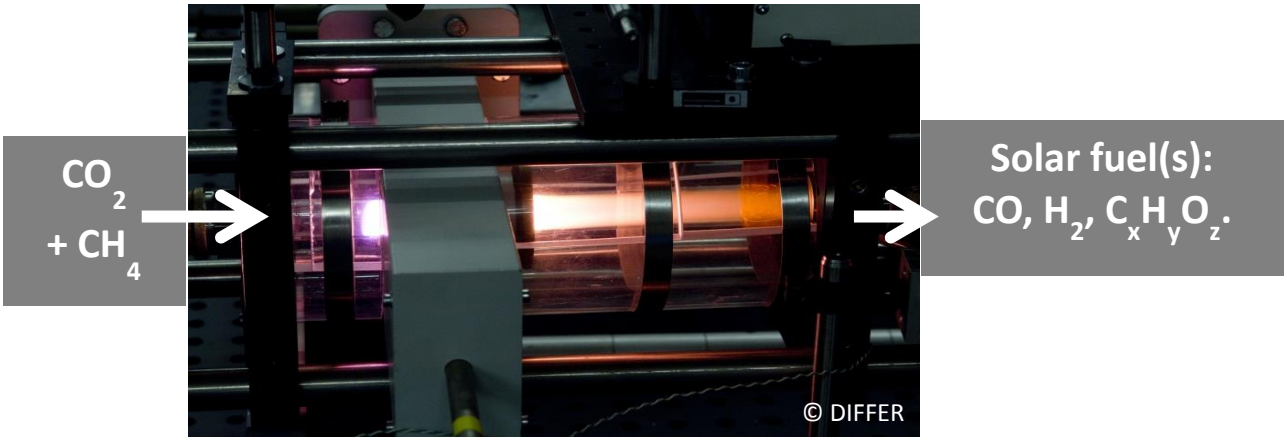
Max-Planck-Institut für Plasmaphysik



Mass spectrometry investigation of the CO_2 microwave plasma for energy storage applications

Area: Experimental investigation of atmospheric pressure MW plasma, mass spectrometry

Duration: 6 months or 1 year

CO_2 is one of the most potent greenhouse gases, and as such is one of the most pressing problems of the 21st century. The capture and recycling/valorisation of CO_2 by plasmas is a promising approach, where still a lot needs to be done in terms of energy optimisation. At IPP we use microwave plasmas for the reduction of CO_2 into CO (+ O_2). Small lab-scale measurements have already shown very good promise using microwave plasmas for conversion of CO_2 into CO both in terms of conversion rate and energy efficiency. These critical parameters are best measured using mass spectrometry. The fundamental mechanisms limiting the plasma efficiency still need to be understood quantitatively in order to express their full potential.

During this Master thesis, the student will learn how perform design calculations, to calibrate a mass spectrometer, and use the latter to determine the plasma gas composition and its energy efficiency. The results will be compared with other plasma diagnostic methods such as optical emission spectroscopy. The Master thesis will focus on the development and use of a custom made mass spectrometer, which is able to operate in a given pressure range of interest (i.e. between 10 and 1000 mbar). The particularity of the custom made solution is that it will be designed so to preserve the plasma gas composition (avoid gas de-mixing effect) over several orders of magnitude of pressure. The expected outcome is to measure the gas composition of the gas treated with the microwave plasma, which is essential for calculating the conversion efficiency and energy efficiency of the MW CO_2 process.

Contact
Prof. Dr.-Ing. Ursel Fantz
ursel.fantz@physik.uni-augsburg.de
Room: 109
Telephone: +49 821 598 - 3310