



2D plasma emissivity maps of the microwave plasma for CO_2 gas conversion

Area: Experimental investigation of atmospheric pressure microwave plasma

Duration: 6 months or 1 year

The 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 is a promising approach, where still a lot needs to be done on optimisation of the process. At IPP we use microwave (MW) plasma for reduction of CO_2 to CO (+ O_2), since MW plasma is currently most promising method for CO_2 reduction. Small lab-scale measurements have shown a potential for the conversion of CO_2 into CO , both in terms of conversion rate and energy efficiency, but the fundamental mechanisms still need to be understood in order to use the full potential of MW plasma.

The master thesis will focus on the optical emission spectroscopy investigation of the radial profile of the MW generated CO_2 plasma using ICCD camera and bandpass interference filters. The student will learn how to operate MW plasma setup, use the ICCD camera and analyse the ICCD images using the Abel inversion method. The Abel inversion, also known as inverse Abel transformation, is a method used for calculating the reconstruction of a circularly symmetric two-dimensional (2D) function from its projection. The expected outcome is better understanding of the plasma dynamics in the resonator and in the afterglow, by generating 2D emissivity maps of different species. Understanding of the species dynamics will allow optimising the CO_2 conversion process in both conversion rate and energy efficiency.

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