**PICLas: A Highly Flexible Particle Code for the Simulation of Reactive Plasma Flows**

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**PICLas** is a parallel high-order three-dimensional PIC-DSMC solver developed cooperatively by the Institute of Space Systems and Institute of Aerodynamics and Gas Dynamics at the University of Stuttgart. Application areas include the simulation of electric propulsion systems, atmospheric entry manoeuvres and laser ablation. As other state-of-the-art simulation codes, PICLas couples methods that consider charged particles as well as particle collisions with chemical reactions, which are handled in a stochastic manner. Possible chemical reactions that occur at different stages within a plasma, are modeled on a microscopic level by employing the recently developed Q-K model.

The talk will focus on the combined concepts realised in PICLas for the simulation of reactive plasma flows. Additional emphasis will be directed towards the laser ablation of metals, where the impacting laser generates a plasma plume in front of a surface that expands into vacuum or a background medium. Different effects within the expanding plume are responsible for charge separation and particle acceleration, which fundamentally affect the expansion characteristics that are important for subsequent laser-plasma interactions.

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