

Fluids and Space Engineering Seminar

Date: Wednesday, January 16, 2019 at 13:00

Location: ZARM, Room 1730

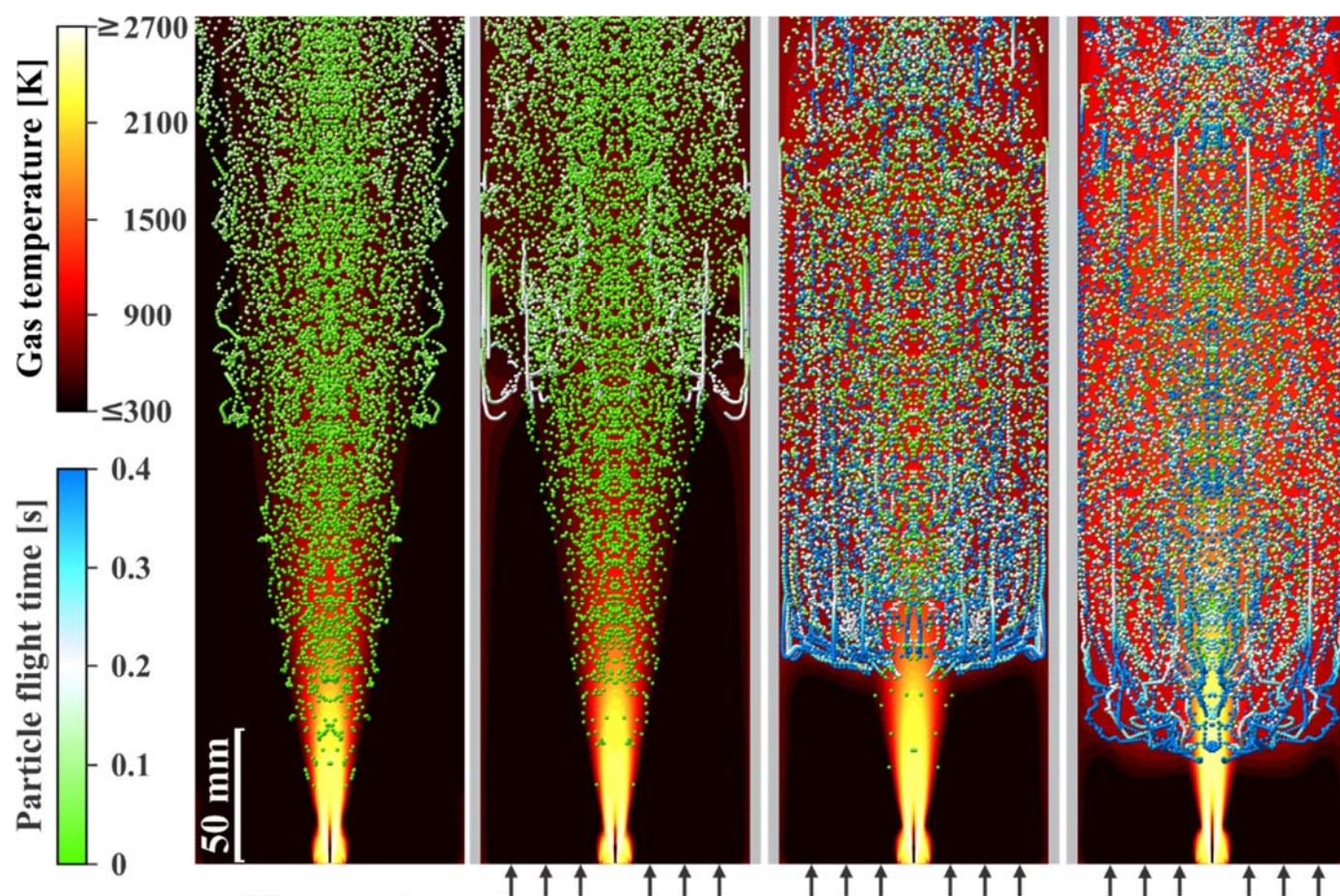
Particle Formation Impacted by Spray Evolution in Enclosed Reactors

Prof. Dr.-Ing. habil. Udo Fritsching

1 Leibniz Institute for Materials Engineering IWT, Bremen, Germany

2 Department of Particles and Process Engineering, University of Bremen, Bremen, Germany

3 MAPEX Center for Materials and Processes, Bremen, Germany



Spray formation in cylindrical enclosure: particle residence time and temperature distribution

To synthesize polymer, ceramic, metal or metal-oxide particles in micrometer size to the nanometer scale range, particle formation from the liquid/melt or vapour/gas phase may be utilized. Spray processes for particle and powder production typically are performed within an enclosed environment (spray tower or spray chamber) – not only for process safety reasons.

In flame sprays, enclosing the spray reactor with application of a specific oxidizer co-flow allows controlling the local fuel-oxygen ratio. Particle nucleation, growth and aggregation from the gas phase may be controlled thereby. Powders can also be produced via melt atomization. Large quantities and material varieties of for instance metal powders are produced in this way. Metallic particulate materials recently gained a lot of interest due to the rapid establishment of additive manufacturing techniques. Main process and product qualities are determined by the particle size distribution and the particle shape (satellite particles). The spray formation and its propagation within the spray container are affected by the shape and size of the enclosure and the control of the entrainment flow and, therefore, these phenomena in the enclosing spray chamber are to be controlled by flow control measures as, for instance, by the superficial secondary gas flow.

In this contribution the role of the entrainment flow and recirculation areas in enclosed spray processes will be highlighted for various applications. Its impact on the particle formation process and possibilities of particle properties control in spray processes are to be evaluated.