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06/11/2015

E I N L A D U N G

zu einem Vortrag im Rahmen des

Kolloquiums Thermo- und Fluiddynamik

Datum: **Mittwoch, 9. Dezember 2015**

Zeit: **16:15 Uhr**

Ort: Maschinenlaboratorium ETH Zürich
Hörsaal ML H 44

Referent: **Prof. Dr. Matthäus Bäbler**
Dept. Chemical Engineering and Technology
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Titel: **Breakup of Small Particle Aggregates in Turbulent Flows**

Particles in the (sub)micrometer range have a strong tendency to stick together and form aggregates. Flow in the suspension carrying the particles has a profound influence on this aggregation process. On the one hand, it increases the rate at which aggregates grow, i.e. by enhancing the collision rate between particles. On the other hand, it causes the breakup of aggregates due to viscous hydrodynamic stress acting on them. In this seminar I will focus on the latter and consider in particular the case where the flow carrying the particles is turbulent. Breakup of aggregates in turbulent flow is an important phenomenon in many industrial and environmental processes, e.g. it plays a crucial role in the processing of industrial colloids and in wastewater treatment where breakup limits aggregate growth and leads to a stationary aggregate size distribution. In other applications, conditions are designed such as to facilitate breakup, e.g. in a dry powder inhaler for the delivery of inhalation drugs.

In our work we investigate the breakup of small aggregates caused by hydrodynamic stress in turbulence through both numerical simulations and experiments. Hydrodynamic breakup in turbulence is a challenging problem as the viscous stress acting on an aggregate is subject of strong fluctuations, and conditions where the hydrodynamic stress overcomes the cohesive strength of the aggregate occur only intermittently and with timescales controlled by turbulent fluid and particle motions. The numerical simulations consider a scenario where preformed aggregates are released into a turbulent flow where they eventually undergo breakup. The aggregates are assumed to be small with respect to the Kolmogorov length scale and the flow is diluted, which allows for treating the aggregates as one-way coupled point particles. Once released, the aggregates are advected by the flow and experience a fluctuating hydrodynamic stress. By measuring this stress, we can determine how often an aggregate experiences conditions that can cause breakup. From this we derive the aggregate breakup rate. The latter is an important quantity for modeling breakup in the framework of population balance equations. Different flow configurations are explored different types of aggregates are considered, i.e. we investigate the cases of tracer-like aggregates and inertial aggregates which corresponding to colloidal aggregates in liquid medium, respectively aerosol aggregates.

Host: PD Dr. D. Meyer-Massetti, Prof. P. Jenny

Gäste sind willkommen!

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