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Particle & Particle Systems Characterization

Contents

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Cover: Ice cream is an example of a complicated multiphase system. It consists of an oily phase and several solid phases in a continuous aqueous phase which has also been foamed. In the deep-frozen state the crystal size of the frozen water is mainly responsible for the deterioration of quality during storage. The cover picture shows these ice crystals. The different colours result from the refractive index given different particle sizes. The sizes of the crystals can be determined by image analysis.

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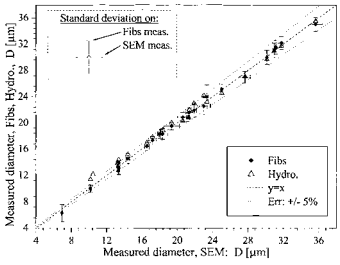
Glass fibers with small diameters are used for example in textiles and for reinforcement applications. This paper presents theoretical and experimental investigations of on-line sizing during fiber production via light scattering and phase-Doppler interferometry. Experimental results demonstrate validity of the model and optimized set-ups to study the fiber drawing process are presented.



Interferometric Sizing of Single-Axis Birefringent Glass Fibers

Fabrice Onofri, Anne Lenoble, Stefan Radev, Hervé Bultynck, Paul-Henri Guering, Nicolas Marsault

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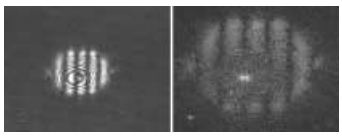
A sophisticated method to measure size and location of droplets in a plane is presented. The method is based on digital holography with numerical reconstruction. The technique is discussed in detail and the optimal analysis method (e.g. in-plane or out of focus) is shown depending on spray characteristics and droplet size. Furthermore, issues associated with the use of a CCD-camera instead of a film are discussed and the capabilities of digital holography are demonstrated.



Digital Holography for Instantaneous Spray Diagnostics on a Plane

Jan Burke, Cecil Hess, Volker Kebbel

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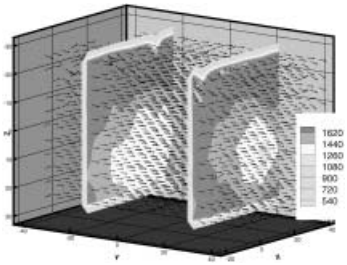
Defocusing digital particle image velocimetry (DDPIV) is a three-component volumetric velocimetry technique that operates at full video rate. Complex, three-dimensional and time-dependent flows can be measured. This paper presents an extension to DDPIV in order to infer bubble sizes from the intensities. Consequently, bubble size distributions and bubble velocity fields can be measured simultaneously. The technique is applied to a bubbly flow in the wake of a hydrofoil and proved to work very reliably.



Applications of Defocusing DPIV to Bubbly Flow Measurement

David Jeon, Francisco Pereira, Morteza Gharib

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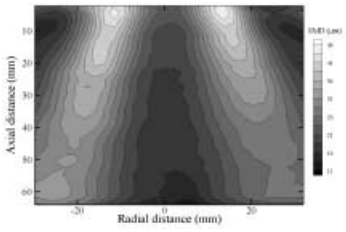
Simultaneous measurement of Mie scattering and laser induced fluorescence by two different CCD cameras allows for the simultaneous determination of Sauter mean droplet size and droplet velocity with high spatial resolution. A complex calibration scheme is introduced to get reliable absolute values. The technique is applied to an industrial gun-type burner and a comparison with phase-Doppler anemometry shows good correspondence. Furthermore, a tracking scheme is used to characterize the dynamics of droplet clusters.



Planar Droplet Sizing for the characterization of droplet clusters in an industrial gun-type burner

Laurent Zimmer, Yuji Ikeda

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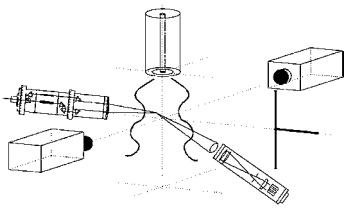
The purpose of this investigation is to assess and improve the accuracy of Sauter mean diameter measurements in dense sprays using a planar droplet sizing (PDS) technique, based on the intensity ratio of scattered and fluorescence light. A novel data processing method is suggested, which was derived from theoretical considerations which helps to reduce possible sizing errors considerably. The new technique shows good agreement with droplet size measurements by phase Doppler anemometry. Furthermore, problems associated with dilute spray regions are discussed.



Quantitative Measurement of Planar Droplet Sauter Mean Diameter in Sprays using Planar Droplet Sizing

Roland Domann, Yannis Hardalupas

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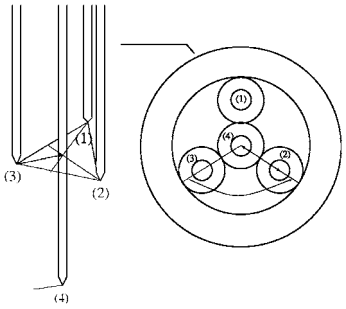
The possibility to measure the velocity and size of individual bubbles in a high-void fraction bubbly flow is investigated by using a newly developed four-point optical fiber probe. In vertical bubbly pipe flow, the probe showed results in good agreement with reference measurements. Furthermore, the slip velocity of the bubbles is determined by simultaneously measuring the fluid velocity by means of laser-Doppler anemometry.



Bubble Velocity and Size Measurement with a Four-Point Optical Fiber Probe

Sebastian Guet, Robbert V. Fortunati, Robert F. Mudde, Gijs Ooms

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