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Planar velocity measurements of the gas and liquid phase in dense sprays by flow tagging

S. Krüger and G. Grünefeld
University of Bielefeld, Faculty of Physics
Postfach 100131, 33501 Bielefeld, Germany
Tel. 49-521-1065442, Fax. 49-521-1062958.
E-mail: gruenefe@physik.uni-bielefeld.de
S. Arndt
Robert Bosch GmbH
FVSLE-Sh, Postfach 106050, 70049 Stuttgart, Germany
W. Hentschel
Volkswagen AG
1785-EZLP, 38436 Wolfsburg, Germany

ABSTRACT

We report on measurements of the gas and liquid phase velocity in *dense* automotive direct injection sprays by 2D laser-based flow tagging. Velocity measurements in dense sprays are generally difficult with conventional techniques because of the high number densities of droplets, the optical thickness of the medium, and multiple light scattering effects. The present flow tagging experiments are based on luminescent molecules which are used as the flow tracer. Flow tagging of the liquid phase is performed by exciting phosphorescence of the tracer molecules by a grid of pulsed write laser beams. The gas phase is tagged by inducing photodissociation of a suitable parent molecule using the write laser grid. The motion of the gas phase is probed by inducing fluorescence from one of the photogragments (NO) by using a read laser sheet. It is demonstrated that instantaneous and mean velocity fields can be measured in this way. This leads to conclusions on the interaction of continuous and dispersed phases in dense sprays.