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Analysis of an acoustic levitator flow field using Particle Shadow Velocimetry AMY LEBANOFF, Karlsruhe Institute of Technology, German Academic Exchange Service Research Internships in Science and Engineering, University of Central Florida, KAI SCHOENEWOLF, STEPHAN AUTENRIETH, CHRISTIAN LIEBER, RAINER KOCH, HANS-JOERG BAUER, Karlsruhe Institute of Technology — High concentrations of Nitrogen Oxide (NOx) emissions from diesel engines pose a threat to the environment. However, selective catalytic reduction (SCR) offers a means to reduce these NOx emissions. Optimization of SCR technology requires study of urea-water-solution (UWS) evaporation behavior to tune droplet evaporation models. Validation data for this purpose may be obtained via observation of acoustically levitated droplets under controlled pressure, temperature, humidity, and flow field conditions. Establishing well-defined conditions prior to actual evaporation experiments is vital for model development. One driving factor behind the heat and mass transfer associated with droplet evaporation is the relative velocity imposed by the flow field of the gas phase near the droplet. To characterize the levitator flow field, Particle Shadow Velocimetry was employed. The optical setup features a double-frame camera equipped with a long-distance microscope that is maneuverable along three axes, allowing for targeted assessment of locations in the acoustic levitator without adjusting the illumination. This measurement technique facilitated incremental improvements which resulted in a symmetric flow field deemed suitable for investigation of UWS droplet evaporation.

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