Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Multi-scale characterization of the effect of gas swirl on two-fluid coaxial atomization. NATHANAL MACHICOANE, Universit Grenoble Alpes, Grenoble INP, CNRS - LEGI, RODRIGO OSUNA-OROZCO, PETER D. HUCK, University of Washington, ALAN L. KASTENGREN, Argonne National Laboratory, ALBERTO ALISEDA, University of Washington — This work aims at developing a better mechanistic understanding of the processes that control the instabilities leading to spray formation in coaxial two-fluid atomization. The goal is to characterize the near-field of the spray, where a dense multiscale turbulent multiphase flow evolves from the nozzle exit as the liquid break-up progresses and the formed inclusions interacts with the turbulent gas jet. We conduct experimental measurements in the optically dense region of the spray created by a canonical two-fluid atomizer, using Synchrotron high-speed radiography at the Advanced Photon Source of Argonne National Lab. We retrieve not only the statistics of the liquid core length, as has been done in previous studies of atomization in a narrower range of spray parameters, but also its characteristic timescales, with the goal of providing a better picture of the dynamic processes that control this important spray metric. This work, together with a complementary study using shadowgraphy at overlapping swirl and gas-to-liquid momentum ratios, yields a complete description of the spray near-field, over a wide range of parameters that are relevant for a broad scope of applications.

Nathanael Machicoane
Universit Grenoble Alpes, Grenoble INP, CNRS - LEGI

Date submitted: 03 Aug 2020 Electronic form version 1.4