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Measurements of turbulent velocity statistics in a microscale rectangular confined impinging jets reactor MICHAEL OLSEN, VISHWANATH SOMASHEKAR, RODNEY FOX, Iowa State University — Microscale chemical reactors capable of operating in the turbulent flow regime, such as the confined impinging jets reactor (CIJR), offer many advantages for rapid chemical processing at the microscale, especially in application such as flash nanoprecipitation used for the production of functional nanoparticles. In the presented work, microscopic particle image velocimetry (microPIV) was employed on a microscale rectangular CIJR to obtain instantaneous velocity fields at jet Reynolds numbers of 200, 1000 and 1500, which corresponds to completely laminar, weakly turbulent, and fully turbulent regimes respectively in the reaction zone. For each Reynolds number, approximately 2000 instantaneous velocity fields were collected to analyze the flow fields and calculate pointwise and spatial turbulence statistics. Large eddy simulation (LES) was then performed to obtain time resolved simulated velocity fields which were then compared with the experimental results. Good agreement was observed between the experimental results and the LES results, demonstrating the viability of LES could be used as a tool for designing microscale reactors.

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