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The Structure of Nanoparticle Nucleation in Three-dimensional Wakes NATHAN MURFIELD, SEAN GARRICK, University of Minnesota — Ultrafine, or nano-scale particles play an integral role in a wide variety of physical/chemical phenomena and processes and have application in microelectronics, chemical gas sensors, and atmospheric processes, to name a few. Accurate prediction of particle production rates and size distributions are of paramount importance in such processes. Physical measurement of particle nucleation and growth is difficult to observe in-situ and computation has the ability to shed light on the underlying physico-chemical dynamics. Direct numerical simulation of the homogeneous nucleation of dibutyl-pthalate (DBP) in turbulent, three-dimensional wakes is performed. The flows consistent of a "hot" mixture of DBP and nitrogen issuing into "cool" nitrogen. The effects of both large-scale and molecular mixing as well fluid turbulence on nano-sized nucleation are investigated under different flows. Additionally, the structure of nano-particle nucleation as well as the effect of the cooling rate on the size distribution of nucleating particles is investigated.

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