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Particle clustering within a two-phase turbulent pipe jet[1] TIMOTHY LAU, GRAHAM NATHAN, The University of Adelaide — A comprehensive study of the influence of Stokes number on the instantaneous distributions of particles within a well-characterised, two-phase, turbulent pipe jet in a weak co-flow was performed. The experiments utilised particles with a narrow size distribution, resulting in a truly mono-disperse particle-laden jet. The jet Reynolds number, based on the pipe diameter, was in the range $10000 \leq Re_D \leq 40000$, while the exit Stokes number was in the range $0.3 \leq Sk_D \leq 22.4$. The particle mass loading was fixed at $\phi = 0.4$, resulting in a flow that was in the two-way coupling regime. Instantaneous particle distributions within a two-dimensional sheet was measured using planar nephelometry while particle clusters were identified and subsequently characterised using an in-house developed technique. The results show that particle clustering is significantly influenced by the exit Stokes number. Particle clustering was found to be significant for $0.3 \leq Sk_D \leq 5.6$, with the degree of clustering increasing as Sk_D is decreased. The clusters, which typically appeared as filament-like structures with high aspect ratio oriented at oblique angles to the flow, were measured right from the exit plane, suggesting that they were generated inside the pipe.

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