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Boiling in acoustically levitated nanofuel droplets[1] KHUSHBOO PANDEY[2], SAPTARSHI BASU[3], Indian Institute of Science — Inclusion of metal/metalloid particles in conventional hydrocarbon fuels has unearthed the possibilities of nexgen energetic fuels. Recent research stride on nanofuel (Base Fuel + Nanoparticles) combustion has shown a unique pathway of droplet secondary atomisation, stemming from heterogeneous boiling. Presence of nanoparticles (NPs) aids internal ebullition in nanofuel droplets. Rupture and expulsion of the bubbles generate high-speed ligaments which further undergo tip break-up. In the current work, we report detailed analyses of evaporation and atomisation characteristics of nanofuel droplets in a contactless environment (acoustic levitation) under external radiative heating. We explore the critical parameters for bubble incipience by varying base fuel vapour pressure, initial droplet size, and the input laser power. A time scale analysis considering orthokinetic NP aggregation, evaporation lifetime, and bubble growth rate is presented to elucidate the mechanism of internal boiling. A theoretical non-dimensional time scale (τ^*) is devised for calculating the lower limit for droplet size necessary to exhibit internal ebullition. REFERENCE Pandey K., and Basu S. 'How boiling happens in nanofuel droplets' Physics of Fluids, 2018, 30, 107103.

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