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Heterogeneous vapor condensation in boundary layers

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Abstract. We consider heterogeneous condensation of vapors mixed with a carrier gas in stagnation point boundary layer flow near a cold wall in the presence of solid particles much larger than the mean free path of vapor particles. The supersaturated vapor condenses on the particles by diffusion, particles and droplets are thermophoretically attracted to the wall. We sketch three asymptotic theories of the condensation process, calculate the flow-induced shift in the dew point interface, vapor density profile and deposition rates at the wall, and compare them to direct numerical simulation [4]. This situation is different from standard homogeneous analyses [1, 2, 3].

References

[1] Igniting homogeneous nucleation, L.L. Bonilla, A. Carpio, J.C. Neu, In Simplicity, Rigor and Relevance in Fluid Mechanics (A volume in honor of A. Liñán on the ocassion of his 70th birthday), F.J. Higuera, J. Jiménez, J.M. Vega Eds., CIMNE, Barcelona, 2004. ISBN 84-95999-58-7

[2] Kinetics of helium bubble formation in nuclear materials, L.L. Bonilla, A. Carpio, J.C. Neu, W.G. Wolfer, Physica D- Nonlinear Phenomena 222(1-2), 131-140, 2006

[3] Igniting homogeneous nucleation, J.C. Neu, L.L. Bonilla, A. Carpio, Physical Review E 71(2), 021601, 2005

[4] Theory of surface deposition from boundary layers containing condensable vapour and particles, J.C. Neu, A. Carpio, L.L. Bonilla, Journal of Fluid Mechanics 626, 183-210, 2009