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Nucleate boiling in the presence of an oscillating torus HARSHAL RAUT, Indian Inst of Tech-Bombay, AMITABH BHATTACHARYA, Indian Inst of Tech-Delhi, ATUL SHARMA, Indian Inst of Tech-Bombay — Direct Numerical Simulations have been conducted to study the effect of a solid oscillating torus on nucleate boiling heat transfer at low superheats in the isolated bubble regime. We use a sharp interface dual grid level set method (SI-DGLSM) to carry out the numerical simulations for nucleate boiling and level set based immersed boundary method (LSIBM) for the fluid-structure interaction. A semi-implicit projection method is used to solve the mass, momentum and energy conservation equations. For nucleate boiling under the influence of oscillating torus, a lock-on regime has been observed, during which the frequency of bubble departure synchronizes with the frequency of torus oscillation over a range of oscillation amplitude and frequencies. The upward motion of the torus pushes the surrounding fluid down which in turn pushes the liquid-vapor interface leading to bubble departure and thus lock-on. The downflow caused by the bubble rise and evaporation of liquid increases in speed due to shorter area close to the wall due to presence of torus thereby leading to thinning of thermal boundary layer and increase in Nusselt number.

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