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Suppression of Leidenfrost effect via low frequency vibrations BOON THIAM NG, YEW MUN HUNG, MING KWANG TAN, School of Engineering, Monash University, 47500 Bandar Sunway, Malaysia — Leidenfrost effect occurs when vapor layer forms in between the coolant and the hot surface above Leidenfrost point, which dramatically reduces the cooling efficiency due to low thermal conductivity of the vapor layer. To prevent surface overheating, there have been number of reported methods to suppress the Leidenfrost effect that were mainly based on functionalization of the substrate surface and application of electric field across the droplet and substrate. In this work, we induce low frequency vibrations (f $\sim 100 \text{ Hz}$) to the heated substrate to suppress the Leidenfrost effect. Three distinct impact dynamics are observed based on different magnitudes of surface acceleration and surface temperature. In gentle film boiling regime, formation of thin spreading lamella around the periphery of the impinged droplet is observed; in film boiling regime, due to thicker vapor cushion, rebound of the impinged droplet is observed; in contact boiling regime, due to the direct contact between the impinged droplet and heated substrate, ejection of the tiny droplet is observed. Also, estimated cooling enhancement ratio for contact boiling regime shows an improvement from 95%to 105%.

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