

Leidenfrost effect in the field of cryogenics

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A liquid droplet or a solid pellet dispensed over a hot substrate levitate on a cushioning layer of their own vapor when the substrate temperature is significantly above the evaporation/sublimation temperature of the floating object, which is the so called Leidenfrost effect. Since its discovery in 1756, it has been widely studied for numerous liquids, however mostly being associated with rather high evaporation temperatures. We here present current activities in the Applied Thermal Sciences Group at UT concerning the Leidenfrost effect for cryogenics, i.e. for liquid nitrogen droplets dispensed on a water pool and solid carbon dioxide pellets above a solid substrate.

Besides a brief summary of the previous activities concerning the Leidenfrost effect for nitrogen droplets floating on a water pool, also the way forward comprising some improvements of the experimental methodology done in order to maximize the reliability and accuracy of the experimental results is presented. For the case of dry ice pellets hovering on a warm substrate, activities in the group concerning examination of their behavior is briefly summarized and preliminary results for the evolution of the vapor layer thickness below such a pellet obtained using optical coherence tomography (OCT) are presented in detail.