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An experimental study of the dynamic Leidenfrost phenomenon
MOHAMMAD KHAVARI, School of Mechanical Aerospace Engineering, Nanyang Technological University, 50 Nanyang Avenue, 639798, Singapore, MOHAMMAD S.M. SAIFULLAH, Institute of Materials Research and Engineering, A*STAR, 2 Fusionopolis Way, 138634 Singapore, TUAN TRAN, School of Mechanical Aerospace Engineering, Nanyang Technological University, 50 Nanyang Avenue, 639798, Singapore — Complete separation between an impacting droplet and a superheated surface can be achieved if the surface temperature is sufficiently high causing spontaneous generation of a vapor layer under the droplet. The transition to such vapor-induced separation, or Leidenfrost regime, depends on numerous parameters such as materials properties and the impact conditions including the impact velocity and surface temperature. Here we provide detailed experimental observations of several distinct impact dynamics at the Leidenfrost transition in order to understand the physical mechanism of such transition. We focus on the liquid-solid interface to identify necessary conditions for Leidenfrost transition to occur. We show that detailed and quantitative measurements of the wetted area during impact may lead to a physical understanding of the Leidenfrost phenomenon.

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