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Direct numerical simulation of the Leidenfrost Effect LUCIA RUEDA VILLEGAS, SÉBASTIEN TANGUY, Institut de Mécanique des Fluides de Toulouse (IMFT) — We present direct numerical simulations of the impact of a single droplet on a heated flat surface in the Leidenfrost regime. To that end, we solve the Navier-Stokes equations, the energy equation, and the species mass fraction equation. The Level Set method is used to track the liquid-gas interface motion and the Ghost Fluid Method is implemented to treat the jump conditions. To get rid of the temporal stability condition due to viscosity, an implicit temporal discretization is used. Some specific numerical methods have been developed to deal with droplet vaporization interface jump conditions. Since the vapor layer is very thin compared to the droplet size, a non-uniform structured grid strongly refined near the wall is used to capture the droplet bounce. We present numerical simulations that enable us to study accurately the bouncing dynamics by analyzing the momentum balance during the droplet bounce. Moreover, we determine from such computation the ratio of the droplet heat transfer flux by comparing the energy used for the phase change (latent heat) to the energy used for droplet heating (specific heat). We then compare the shape of the droplet during the impact with some experimental results.

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