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Wetting dynamics beneath fluid drops impacting on hot surfaces

KIRSTEN HARTH, MICHIEL A. J. VAN LIMBEEK, MINORI SHIROTA, CHAO SUN, DETLEF LOHSE, Physics of Fluids, Universiteit Twente — Fluid droplets encountering a phase transition when they impact a target surface are involved in many applications, e.g., spray cooling or painting / coating, ink-jet and 3D printing, soldering, firefighting using sprinklers. Drop impact on hot plates is an emerging topic, involving a complex interplay of hydrodynamics, heat flux and the occurring phase transition, involving large spatial and temporal gradients. Whether and to what extent droplets touch the surface is of immense importance for the overall heat transfer. High-speed total internal reflection imaging allows us to discriminate wetted and vapor-covered regions of the substrate. We study the transient wetting behaviour of the plate by varying the latent heat of the droplet. The characteristic cooling time of the plate is not solely determined by the plate properties. In addition to current literature, we show that in those cases the wetting pattern is both spatially and temporally inhomogeneous.

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