Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Surrounding gas-independent splash at high-velocity drop impact with a projected smooth solid surface[1] MASAO WATANABE, TAKU ASHIDA, KAZUMICHI KOBAYASHI, HIROYUKI FUJII, Hokkaido University, TOSHIYUKI SANADA, Shizuoka University — We study a drop impact on a fast-moving smooth solid plate in a reduced-pressure condition. A water drop of radius R=1.1 mm was released from a rest needle in a stainless vacuum chamber; then, the free falling drop was brought into collision with a vertically upward flying solid impact plate which was projected by an iron bullet accelerated by a coilgun.The impact plate consisted of a cover glass with a static contact angle of 60° and a surface roughness R_a of 2.1 nm, adhered to an acrylic plate. The surrounding gas pressure was varied between 1 and 100 kPa, and the impact velocity was varied between 4.2 and 33 m/s. The drop impact on a smooth solid plate with high impact velocity and the subsequent splash was recorded by a high-speed video camera at a frame rate of 1,000,000 fps at pixel resolution of 16.1 μm/px. In a reduced-pressure condition, preceding the occurrence of corona splash, fine daughter droplets, possibly smaller than those observed in corona splash, fly extremely fast along the solid surface only for a few microseconds. The experimental results show that this splashing is independent of both the surrounding gas pressure and gas species. We discuss the threshold of the occurrence of this splashing and identify the mechanism for this splashing.

[1]The authors thank Society for the Promotion of Science, JSPS KAKENHI Grant Numbers JP16K06073 and JP17H03168, for supporting this work.

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Date submitted: 29 Jul 2019 Electronic form version 1.4