Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Numerical study of droplet impact and rebound on superhydrophobic surface[1] XUAN CAI, YANCHEN WU, MARTIN WOERNER, BETTINA FROHNAPFEL, Karlsruhe Institute of Technology — Droplet impact and rebound on superhydrophobic surface is an important process in many applications; among them are developing self-cleaning or anti-icing materials and limiting liquid film formation of Diesel Exhaust Fluid (DEF) in exhaust gas pipe. In the latter field, rebound of DEF droplet from wall is desired as an effective mean for avoiding or reducing unwanted solid deposition. Our goal is to numerically study influence of surface wettability on DEF droplet impact and rebound behavior. A phase-field method is chosen, which was implemented in OpenFOAM by us and validated for wetting-related interfacial flow problems. In the present contribution we first numerically reproduce relevant experimental studies in literature, to validate the code for droplet impact and rebound problem. There we study droplet-surface contact time, maximum/instantaneous spreading factor and droplet shape evolution. Our numerical results show good agreement with experimental data. Next we investigate for DEF droplets the effects of diameter, impact velocity and surface wettability on rebound behavior and jumping height. Based on Weber number and equilibrium contact angle, two regimes are identified. We show that surface wettability is a deciding factor for achieving rebound event.

[1]This work is supported by Foundation Friedrich-und-Elisabeth Boysen Stiftung fuer Forschung und Innovation (BOY-127-TP1).

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Date submitted: 24 Jul 2017 Electronic form version 1.4