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An interaction of impacting droplets with superhydrophobic coatings

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A creation of new engineering materials with the super-hydrophobic properties is inspired by the nature where many water-repellent surfaces in plants and animals are caused by a complex 3D micro- or nano-structures of the hydrophobic papillae (Figure 1).

The purpose of the current work is an experimental fabrication of new engineering materials from water repellent surfaces. To achieve this effect, the bulk materials are coated with hydrophobic polymer foils. To increase the hydrophobicity of the polymer surface, appropriate micro- and nanostructuring can be produced using a highly advanced nanolithographic method, which uses Roll-to-Roll Extrusion Coating (Figure 2). This high-speed and low cost lithography method is developed at DTU and Danapak Flexibles A/S (Murthy et al 2016; Telecka et al 2016, Okulova et.al. 2017). Coatings with different types of the micro- and nano-structures (Figure 3) can easily be fabricated for different scientific and industrial applications. The purpose of the current work is an experimental investigation of the water droplets impacting on the superhydrophobic coatings structured by the Roll-to-Roll Extrusion coating method.

Later-time dynamics (the cotact angles and the maximum spreading ratio of the droplet diameters) of the impacting droplets are measured for different Weber numbers. The maximum spreading ratios as a function of the impact Weber number found in experiments are then compared with simple analytical estimates of the maximum spreading diameter by both momentum and energy balance approaches (Wildeman et al 2016).

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References

