Drop Dynamics on Superhydrophobic Surfaces: Fundamentals to Applications

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Abstract

The interaction between liquid drops and superhydrophobic surfaces continues to unveil rich and complex physical phenomena, with broad implications for energy, environmental, and thermal applications. In this talk, I will present an overview of our recent research on drop dynamics on superhydrophobic surfaces. I will begin by discussing the fundamental aspects of droplet impact—particularly spreading and retraction—and their influence on contact time and heat transfer. Next, I will explore the dynamics of liquid penetration through porous superhydrophobic surfaces during impact, including the criteria governing penetration and the utilization of this process for controlled microdroplet generation. Finally, I will address the behavior of droplets during phase change events on superhydrophobic surfaces, highlighting the interplay between interfacial dynamics and thermal transport.

Keywords: superhydrophobic surface, drop impact, contact time, microdroplet, phase change phenomena

Figure 1. Example of drop impact dynamics on a superhydrohobic surface. A 3 mm-diameter water droplet impacts a CuO-based superhydrophobic surface at a velocity of 6 m/s.

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