

Probing the Origin of Splashing on a Dry Smooth Substrate

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When a droplet falls on a smooth substrate, air can be confined between the liquid and solid. By fabricating substrates with tiny holes, through which air can drain away during an impact, we can completely suppress splashing. Our experiments suggest that the thin air layer beneath the edge of the spreading droplet is essential for splashing, while the air bubble trapped at the center of impact plays a minor role. We propose a modified Kelvin-Helmholtz instability model that explains all our experimental findings. This model may also explain the origin of splashing on smooth substrates and provide important guidance for the practical issue of splashing control.