

## Impact dynamics of liquid droplet with altering surface tension over hierarchical nanostructure surfaces

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Analyzing impact dynamics is critical for practical applications of superhydrophobic surfaces, because these nonwetting surfaces frequently confront impacting liquid droplets in real environments. In the current work, we have newly studied the effects of surface tension on impact dynamics using an ethanol–water solution as a model liquid system. We systematically altered the liquid’s surface tension by changing the ethanol concentration. For an impact dynamics study, two surfaces, namely ZnO nanowires (NWs) and ZnO/Si hierarchical (HIE) structures, were prepared. Under dynamic conditions, our analysis was conducted using a high-speed camera. The transition We numbers were obtained on both surfaces for differing surface tensions of liquids. Under the same dropping conditions, the ZnO/Si HIE surface shows higher transition We numbers, which is due to the higher fraction of air pockets, arised from dual dimensional structures. To understand the mechanism of dynamic transition, we developed a model for ZnO/Si HIE structures based on three determining pressures: anti-wetting, wetting, and effective water hammer pressures. The modeling results explain the experimental observations.