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Experimental characterization and numerical simulation of crown propagation induced by impingement of droplet train TAOLUE ZHANG, JORGE ALVARADO, Texas A&M Univ, ANOOP KANJIRAKAT, REZA SADR, Texas A&M University at Qatar, TAMU-TAMUQ TEAM — In this combined experimental and numerical study, hydrodynamics of single stream of HFE-7100 droplets striking a pre-wetted solid surface was investigated. ANSYS Fluent CFD software was employed to simulate this process numerically. Experimentally, single stream of mono-dispersed droplets were produced using a piezoelectric droplet generator with the ability to adjust parameters such as droplet impingement frequency, droplet diameter and droplet velocity. A high speed camera system was used to capture the liquid crown propagation process given the high frequency of droplet impingement. Low-Weber number droplet impingements resulted in smooth spreading of the liquid crown while splashing (i.e. the emergence of secondary droplets from the rim of the crown) was observed at high Weber number cases. The dynamics of the crown propagation was analyzed and a correlation that takes into account non-dimensional crown diameter (d^*) and non-dimensional time (t^*) has been postulated. The correlation has a mathematical form of $d^* = K \cdot (t^*)^{1/2}$, where K is a constant. Comparison of the dynamics of crown propagation between experiments and numerical simulations yielded reasonable agreement.

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