

Coalescence Cascade of Vertically-aligned Water Drops on a Super-hydrophobic Surface in Silicone Oil

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Abstract : This report, an experimental investigation, concerns the sessile daughter drop remaining during the coalescence of water drops in a liquid-liquid (LL) system. The two drops are initially vertically aligned where the sessile drop is deposited on a chemically treated super-hydrophobic surface of a cube fill of silicone oil. In order to analyze the coalescence dynamics, a series of experiments have been performed using a generation droplets system (KRUSS) that measures contact angles as well coupled with a high-speed camera (Keyence VW-9000E) to record the process at a frame rate of 15000s-1. It's depicted that in such configuration, the head drop volume has a primordial impact on the dynamics of the coalescence process, especially at the last stage. It's found that for a sessile drop deposited on a super-hydrophobic surface, where the contact angle is about $\theta \approx 145^\circ$, the coalescence process is remarked to be complete without any recoiling of the coalesced drop or a generation of a sessile daughter drop at the super-hydrophobic surface when the head drop volume is small enough ($V_{a\beta} < V_s$ up to $V_{a\beta} = 3V_s$). On the other side, the coalescence process starts to be followed by jumping off the resulted drop as well as a remaining of a small sessile daughter drop on the bottom surface of the cube from a head drop volume $V_{a\beta}$ of about 4 times than that of the sessile drop V_s .

Keywords : drops coalescence, dispersed multiphase flow, drops dynamics, liquid-liquid system

Conference Title : ICMFPA 2021 : International Conference on Multiphase Flow Phenomena and Applications

Conference Location : Copenhagen, Denmark

Conference Dates : July 19-20, 2021