BUBBLE ENTRAPMENT AND FINE JETTING DURING IMPACT OF IMMISCIBLE DROP ON A POOL

Ziqiang Yang[1] and S. T. Thoroddsen[1]

[1]King Abdullah University of Science and Technology (KAUST), Thuwal 23955-6900, Saudi Arabia

ziqiang.yang@kaust.edu.sa

We investigate the impact of a drop into a deep immiscible liquid pool, with focus on bubble entrapment and the formation of fine jetting during the crater collapse. We use a heavy perfluorohexane drop which impacts on a water pool, where the two liquids are immiscible. The drop first deforms and stretches out at the bottom of the crater, before collapsing during its rebound, entrapping a small bubble and shooting out fine vertical jet. Several air-entrapment scenarios are observed, such as microbubbles left behind by film ruptures and bubble pinch-off from the dimple. We also see bubbles entering the jet. The entrapment regimes are mapped in the Weber - Froude number space. The size of entrapped bubbles at different impact conditions is scaled with Weber number, We. The formation of fine jetting is also studied. The fastest jets are observed with the speeds of 45 m/s and occur at the multi-dimple case without pinch off. At low Weber numbers a variety of other entrapment phenomena appear.

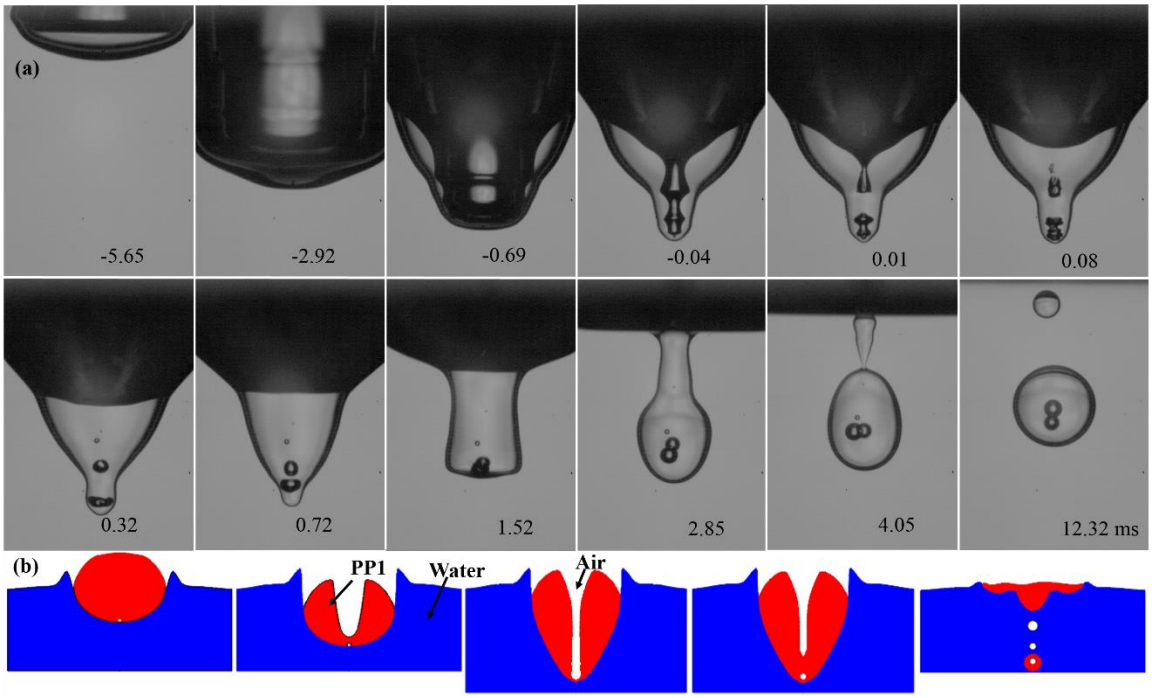

Figure 1. Close-up of typical bubble entrapment process during the crater evolution at U=1.72 m/s, D =1.3 mm, Re = 4215, Fr= 259, We= 493. The video is taken at 75 kfps. Air bubbles are entrapped through the top of the drop.

ACKNOWLEDGEMENTS: This research was supported by King Abdullah University of Science and Technology (KAUST) under Grant No. URF/1/2621-01-01.

REFERENCES:

1. Thoroddsen, S. T., Takehara, K., Nguyen H. D. and Etoh, T. G. 'Singular jets during the collapse of drop-impact craters', *Journal of Fluid Mechanics*, **2018**, 848: R3.

2. Lhuissier, H., Sun, C., Prosperetti, A. and Lohse, D. 'Drop fragmentation at impact onto a bath of an immiscible liquid', Physical review letters, **2013**, 110(26), 264503.