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Dynamics of an air film entrapped by drop impact on liquid surface JI SAN LEE, Postech, BYUNG MOOK WEON, Sungkyunkwan University, SU JI PARK, JI WON JUNG, JI TAE KIM, JAEYEON PYO, POSTECH, KAMEL FEZZAA, Argonne National Laboratory, JUNG HO JE, POSTECH — When a liquid drop impacts a liquid substrate, air is entrapped underneath, finally evolving into spherical bubbles. This phenomenon occurs robustly and plays an important role in various natural phenomena and industrial applications. In this study, we investigated the evolution of an entrapped air film during drop impact using ultrafast X-ray phase-contrast imaging. The evolution exhibits very complex and different behaviors depending on fluid properties. We reveal that the retraction dynamics of the air film crosses from a capillary-inertial regime to a capillary-viscous regime by the increase of Ohnesorge number (Oh). At Oh <0.03, a daughter droplet is generated inside the air film, due to the convergence of the capillary waves generated during the retraction. We also find that the evolved bubble is broken up into two at low Oh, driven by its vertical stretching and capillary instability. We finally demonstrate a phase diagram for the formation of daughter droplet and bubble breakup in terms of Oh and Weber number (We).

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