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Droplet generation from jet-like surface waves by a spark-generated underwater bubble[1] YOUN J. KANG, Northwestern university, KAIST, YEUNWOO CHO, KAIST — An underwater bubble is generated by electric spark near a free surface, where the inception position of the bubble below the free surface is d and the maximum radius of the bubble is R_m. As a result, various jet-like surface waves are observed according to d/R_m and droplets are generated from the perturbed jets. Assuming that the perturbation wavelength is $h - a$ (h is the maximum height of the jet before the generation of droplets and a is the average droplet radius), the droplet-generation mechanism can be successfully explained using the classical Rayleigh-Plateau instability, which has never been applied to the droplet generation by an underwater bubble. It was also experimentally found that there exists a discretely proportional relationship between h/R_m and the number of pinched off droplets (n); no droplet ($n = 0$) is generated when $0 < h/R_m < 3.3$; a single droplet ($n = 1$) is generated when $3.3 < h/R_m < 4.4$; two droplets ($n = 2$) when $4.4 < h/R_m < 6.0$; three droplets ($n = 3$) when $6.0 < h/R_m < 7.6$. This relationship is analytically explained using the conservation of mass. Finally, after its generation, the oscillatory motion of a droplet is studied both experimentally and analytically, which shows a good agreement between each other.

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