

Abstract Submitted
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Jumping number in the droplet jumping by resonant AC electrowetting¹ SANGHYUN LEE, SEUNG JUN LEE, KWANG HYOUNG KANG², POSTECH, South Korea — The droplet jumping by resonant AC electrowetting (DJ-RACE) is recently introduced to transport droplets to vertical direction, whereby three-dimensional digital microfluidics are envisioned. In DJ-RACE, the central mechanism of the droplet jumping is the conversion of the surface energy stored by resonant AC electrowetting to the kinetic energy for jumping. Here, we newly introduce the jumping number ($J_u = \gamma / \rho g R^2$), measuring the energy conversion in the jumping process and, thus, the feasibility of droplet jumping. J_u interprets that droplets having higher J_u can make higher and easier jumping, and smaller and lighter droplets with higher surface tension can have higher J_u . Practically, J_u should be greater than 1.5 for the droplet jumping, and active jumping was observed when J_u is greater than 5. In addition, J_u can predict the effect of diverse physicochemical changes in a system such as enzymatic additives or impurities on jumping, where it can also provide diverse strategies to compensate these changes. The newly introduced J_u could be the fundamental and useful parameter in the three-dimensional digital microfluidic devices based on DJ-RACE.

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