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Droplet formation at the non-equilibrium water/water (w/w) interface YOUCHUANG CHAO, SZE YI MAK, The University of Hong Kong, TIANTIAN KONG, Shenzhen University, ZIJING DING, University of Bristol, HO CHEUNG SHUM, The University of Hong Kong — The interfacial instability at liquid-liquid interfaces has been intensively studied in recent years due to their important role in nature and technology. Among them, two classic instabilities are Rayleigh-Taylor (RT) and double diffusive (DD) instabilities, which are practically relevant to many industrial processes, such as geologic CO₂ sequestration. Most experimental and theoretical works have focused on RT or DD instability in binary systems. However, the study of such instability in complex systems, such as non-equilibrium ternary systems that involves mass-transfer-induced phase separation, has received less attention. Here, by using a ternary system known as the aqueous two-phase system (ATPS), we investigate experimentally the behavior of non-equilibrium water/water (w/w) interfaces in a vertically orientated Hele-Shaw cell. We observe that an array of fingers emerge at the w/w interface, and then break into droplets. We explore the instability using different concentrations of two aqueous phases. Our experimental findings are expected to inspire the mass production of all-aqueous emulsions in a simple setup.

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