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The stability of a droplet suspended in a straight micro-channel HAIDER HEKIRI, TAKUMI HAWA, School of Aerospace and Mechanical Engineering, The University of Oklahoma, Norman, OK 73019 — CFD simulations of the dynamics of a two-dimensional, incompressible, and two coupled spherical-cap water droplets suspended in a straight micro-channel, whose channel height is D, have been conducted to investigate the stability of the droplet. FLUENT with a 2-D pressure based solver is utilized in this simulation. The suspended droplet states are measured by the location of the central of mass of the droplet. We find that there is a critical volume, Vc(D), where asymmetric droplet states appear in addition to the basic symmetric states when $V > Vc(D)$. Using the CFD it is demonstrated that when $V < Vc(D)$ the symmetric droplet states have a stable mode. However, when $V > Vc(D)$ the symmetric states become unstable and asymmetric states have a stable mode. The bifurcation of asymmetric states at Vc(D) has a pitchfork nature. The simulations clarify the relationship between the linear stability results and the experimental results of the droplet behavior.

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