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Motion of a bubble ring in a viscous fluid JING LOU, MING CHENG, Institute of high Performance Computing, Singapore, T.T. LIM, National University of Singapore, INSTITUTE OF HIGH PERFORMANCE COMPUTING, SINGAPORE TEAM, NATIONAL UNIVERSITY OF SINGAPORE TEAM — A Lattice Boltzmann Method and limited experiments were undertaken to study the dynamic of a vortex ring bubble (or bubble ring) in a viscous incompressible fluid. The study is motivated partly by our desire to assess whether a bubble ring keeps increasing its radius and decreasing its propagation velocity as it rises through fluid was predicted by Turner (1957) and Pedley (1968) or does the ring eventually reach a steady state where its radius and velocity remain constant as was predicted by Joseph et al (2008). The parameters investigated included ring circulation, Reynolds number, density ratio and Bond number. Our experimental and numerical results show that a rising bubble ring increases its radius and decreases its velocity, but the process is interrupted by ring instability that eventually causes it to break up into smaller bubbles. For the range of flow conditions investigated, there is no evidence that a bubble ring has attained a constant speed and constant radius before breaking up. Furthermore, it is found that increasing initial circulation has a stabilizing effect on a bubble ring while increasing Reynolds number or Bond number hastens ring instability, resulting in an earlier break up into smaller bubbles.

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