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Path instablity of a rising bubble: Shape matters, Reynolds number doesn't! ROBERTO ZENIT[1], Universidad Nacional Autonoma de Mexico, JACQUES MAGNAUDET, Institut de Mecanique des Fluides de Toulouse — The conditions for the transition to zigzagging trajectories for freely ascending bubbles were studied experimentally. To avoid surface contamination, we used silicon oils with shear viscosities ranging from 1.7 to 9.4 times that of water. Since these fluids are non-polar, as opposed to the case of water, the gas-liquid interfaces remain clean without the need of an ultra-pure environment. Using a 30 cm height cylindrical container, the shape and trajectory of millimetric-sized air bubbles were filmed with a high-speed camera. We found that the most important parameter for the transition from a rectilinear to a zigzagging trajectory is the bubble aspect ratio and not so much the Reynolds number. We found that the Reynolds number at incipient transition varied from 85 to 250, for decreasing liquid viscosity. Correspondingly, the bubble aspect ratio remained relatively constant ranging from 2.23 to 2.11 for the same set of conditions. Since vorticity at the bubble surface is almost independant of the Reynolds number and mostly depends on the bubble shape in the parameter range covered by our experiments, these results support the idea that surface vorticity, which in turn causes the wake to become unstable, is the principal cause for the transition to a oscillatory trajectory, as recently discussed by Magnaudet and Mougin (2007).

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Roberto Zenit
Universidad Nacional Autonoma de Mexico

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