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Shape instability of a bubble in a viscoelastic medium[1] KAZUYA MURAKAMI, Univ of Michigan - Ann Arbor, RENAUD GAUDRON, Ecole CentraleSuplec, Universit Paris-Saclay, ERIC JOHNSEN, Univ of Michigan - Ann Arbor — Bubble dynamics play an important role in therapeutic ultrasound and other medical applications. For this reason, we investigate the shape instability of a single gas bubble in a viscoelastic, tissue-mimicking medium. The non-spherical bubble surface is expressed by superposition of spherical harmonics. Cauchy's equation of motion is reduced to two ordinary differential equations: the Rayleigh-Plesset type equation for the mean bubble radius and the equation for the mode amplitude, which are solved simultaneously. For a given bubble radius and frequency, the parametric instability is determined by the n-th order natural frequency. In addition, the amplitude threshold of the mean radius is analytically found by the stability theory for Mathieu equation. Our analysis is validated against experimental results, in which non-spherical bubble oscillations are observed under ultrasound irradiation. Finally, the pressure threshold for the shape instability is numerically examined.

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