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Inertial cavitation threshold in a viscoelastic medium[1] KAZUYA MURAKAMI, ERIC JOHNSEN, University of Michigan — Cavitation bubbles play a significant role in medicine such as histotripsy or traumatic brain injury. Elevated temperatures, high strain rates, and shock waves are generated by the bubble dynamics, which may damage the surrounding tissue. These phenomena are thought to originate from inertially dominated bubble oscillations. It is thus important to determine a criterion governing inertial cavitation in tissue. For this reason, we numerically investigate the threshold for inertial cavitation in a tissue-mimicking, viscoelastic medium. We use a Rayleigh-Plesset-type equation, where compressibility, heat diffusion, mass transfer and nonlinear elasticity are taken into account. We apply a negative pressure pulse to a bubble and examine its expansion and subsequent collapse. In particular, we investigate the amount of energy dissipated by various means and determine the conditions under which inertia becomes dominant. Since viscoelasticity reduces bubble growth, the inertial cavitation threshold becomes higher in tissue-like media.

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