Acoustic interaction between a coated microbubble and a nearby surface – Steady pulsations vs. transient break-up

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K. Efthymiou[†] and N. Pelekasis[†]

[†]Department of Mechanical Engineering
University of Thessaly
Leoforos Athinon, Pedion Areos, 38334 Volos, Greece
e-mail: pel@uth.gr, web page: http://www.mie.uth.gr

ABSTRACT

Boundary element simulations are performed on coated microbubbles that pulsate subject to acoustic disturbances. Their coating is treated as a viscoelastic solid while the surrounding liquid is treated as an ideal fluid. When the microbubbles are immersed in an infinite medium they pulsate upon insonation performing radial or axisymmetric shape oscillations depending on the sound amplitude and frequency, as well as the shell material, initial size and stress state. Further increase of sound amplitude determines a threshold between steady pulsations and transient break-up that is of central importance in establishing the parameter window for implementing imaging modalities using such particles as contrast agents. The effect of a nearby surface in modifying the microbubble response is investigated, by treating the former as a rigid wall or elastic medium. In particular, the time evolution of the distance between the microbubble and the surface is monitored and its effect on the backscatter cross-section and microbubble cohesion is captured. A comparison is also performed against available in vitro acoustic and optical measurements.