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Model of Therapeutic Ultrasound Contrast Agent Dynamics CHAO-TSUNG HSIAO, XIAOZHEN LU, GEORGES CHAHINE, Dynaflow, Inc. — Targeted drug and gene delivery are rapidly emerging applications for ultrasound contrast agents since this could reduce potential deleterious side effects to healthy tissue and minimize the overall dose needed. Therapeutic ultrasound contrast agents are encapsulated microbubbles usually composed of a high molecular weight gas core and a highly viscous thick liquid shell. Development of new contrast agents requires a good understanding of the stability and breakup mechanisms of the liquid shell when subjected to ultrasonic acoustic waves. A novel numerical code, which enables one to investigate the dynamics of thick-shelled contrast agents and the interaction between multiple agents and with nearby boundaries has been developed by coupling a Boundary Element Method solver and a finite-volume Navier-Stokes solver. We have applied the coupled code to examine shell breakup mechanisms for contrast agents near a solid wall. We found that the shell thickness varies significantly from location to location due to non-spherical deformations and that the contrast agent may break up due to local shell thinning and stretching as the non-spherical deformation is significant.

> Chao-Tsung Hsiao Dynaflow, Inc.

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