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Influence of cavitation bubble growth by rectified diffusion on cavitation-enhanced HIFU[1] KOHEI OKITA, Nihon University, KAZUYASU SUGIYAMA, Osaka University, SHU TAKAGI, the University of Tokyo, YOICHIRO MATSUMOTO, RIKEN — Cavitation is becoming increasingly important in therapeutic ultrasound applications such as diagnostic, tumor ablation and lithotripsy. Mass transfer through gas-liquid interface due to rectified diffusion is important role in an initial stage of cavitation bubble growth. In the present study, influences of the rectified diffusion on cavitation-enhanced high-intensity focused ultrasound (HIFU) was investigated numerically. Firstly, the mass transfer rate of gas from the surrounding medium to the bubble was examined as function of the initial bubble radius and the driving pressure amplitude. As the result, the pressure required to bubble growth was decreases with increasing the initial bubble radius. Next, the cavitation-enhanced HIFU, which generates cavitation bubbles by high-intensity burst and induces the localized heating owing to cavitation bubble oscillation by low-intensity continuous waves, was reproduced by the present simulation. The heating region obtained by the simulation is agree to the treatment region of an in vitro experiment. Additionally, the simulation result shows that the localized heating is enhanced by the increase of the equilibrium bubble size due to the rectified diffusion.

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