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Measurement of distribution of broadband noise and sound pressures in sonochemical reactor

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Cross-sectional area distribution of broadband noise in a sonochemical reactor was measured to estimate reaction fields. A needle-type hydrophone scanned the sonochemical reactor in horizontal and vertical directions at one-millimeter interval. To show an absolute value of broadband noise, average of broadband sound pressure was defined. The distribution of sound pressures at the fundamental and second harmonic frequencies were also measured. In the case of driving frequency at 130 kHz, sonochemical reaction fields were observed in several ellipse shapes. The reaction fields in upper part of the reactor was high because cavitation bubbles moved upper part due to radiation force. The sound pressure distribution at the fundamental frequency showed existence of standing wave and reaction fields were weak at pressure antinode because cavitation bubbles were repelled by primary Bjerknes force. The sound pressure distribution at the second harmonic frequency indicated that the pattern of bubbles distribution resembled to that of reaction fields closely. In the case at 43 kHz, distributions of reaction fields and sound pressures were complex due to coupled vibration. The reaction fields were relatively weak in areas which had very high sound pressures at the fundamental frequency.

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