The Impact of Ultrasonic Transducer placement on cavitation patterns and effect

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RESEARCH QUESTION

How does the spatial configuration and angle of ultrasonic transducers influence the formation, density, and erosive power of cavitation bubble patterns?

BACKGROUND

Acoustic cavitation—the formation and collapse of vapor bubbles in a liquid—is driven by ultrasonic waves. While widely used for cleaning and sonochemistry, the energy distribution is often non-uniform. By understanding how placement affects interference patterns, we can maximize efficiency and prevent "dead zones" in the fluid.

METHODS

this study utilized a multi-transducer ultrasonic array submerged in a temperature-controlled aqueous environment to observe the formation of acoustic cavitation. By systematically varying the spatial configuration—specifically adjusting the distance between transducers and the angle of incidence—we mapped the resulting interference patterns. Data was collected using high-speed photography to visualize bubble cloud formation, while aluminum foil erosion tests were employed as a physical proxy to quantify the intensity and distribution of the erosive force at specific coordinates within the tank.

Optimizing the physical arrangement of ultrasonic transducers significantly alters cavitation "hotspots," allowing for more precise control over acoustic energy distribution in industrial and medical applications.

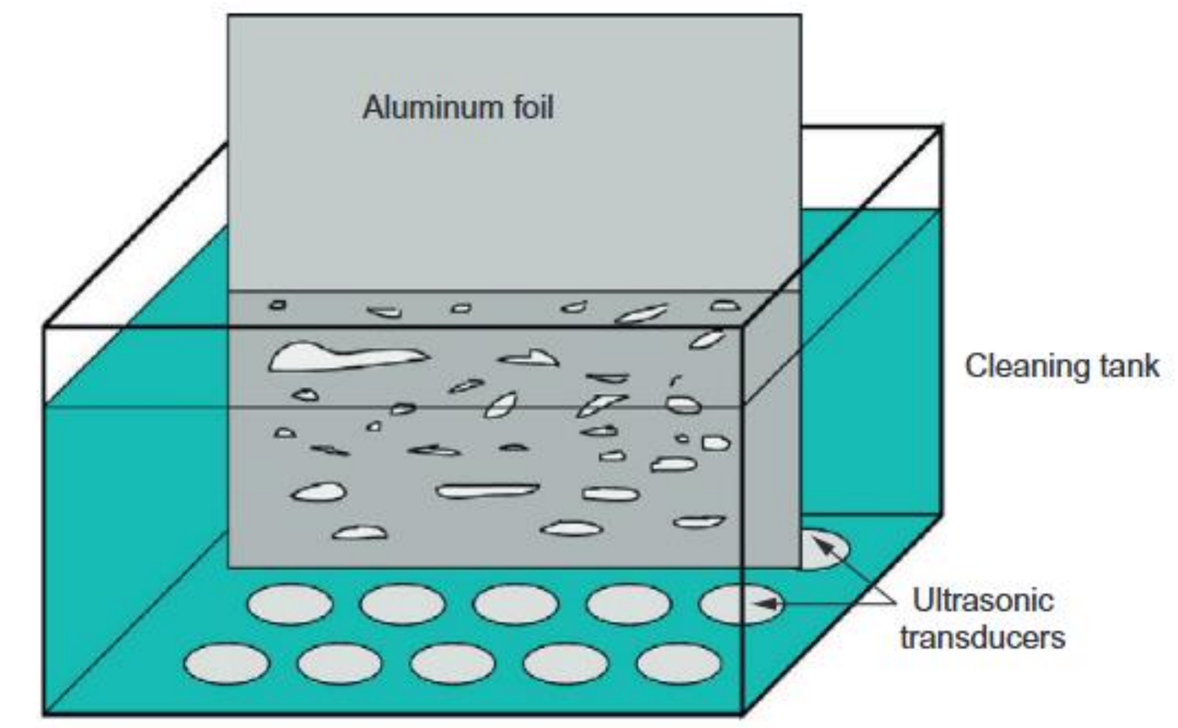

Figure 19.4 Aluminum foil is placed vertically in an ultrasonically activated tank. Tank effectiveness is based on the erosion density and pattern seen on the foil after exposure.

RESULTS

TBA

FUTURE DIRECTIONS

TBA

ACKNOWLEDGEMENTS

Small section if needed depending on your project