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Autore	Hu Jinsen
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Altri autori (Persone)	ZhangYuning ChengYongpan
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Nota di contenuto	Introduction -- Bubble Dynamics Under Acoustic Excitation -- Propagation of Sound Waves in Vapor/Gas/Liquid Multiphase Flow -- Cavitation in Vapor/Liquid/Solid Multiphase Flow -- Conclusions.
Sommario/riassunto	This brief provides a comprehensive analysis of multiphase flow with bubbles, covering bubble dynamics, sound wave propagation in vapor/gas/liquid multiphase flow, and vapor/liquid/solid multiphase flow with sand particles. It begins by introducing the cavitation nucleation mechanism and examining bubble oscillation equations in liquids, including first-order and second-order models. Further discussions explore the mass transfer effects at the bubble wall, energy dissipation mechanisms, and bubble behavior under dual-frequency acoustic fields. Regarding sound wave propagation in vapor/gas/liquid multiphase flow, the book presents a wave speed prediction model,

details the solution process and propagation characteristics, and examines how vapor fraction, bubble radius, and void fraction influence critical frequency and wave speed stability. The section on vapor/liquid/solid multiphase flow focuses on the bubble collapse process, analyzing jet phenomena—including single jet, multi-jet, and needle jet formations—along with shock wave phenomena occurring during cavitation bubble nucleation, splitting, and collapse. Additionally, it explores the synergistic erosion effects of cavitation bubbles and sand particles on hydraulic machinery. Designed for academic researchers and graduate students in fluid dynamics, this book consolidates core theories, physical mechanisms, and the latest advancements in multiphase flow research.

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