

# Contents

<b>1</b>	<b>Acoustic Cavitation</b>	<b>1</b>
1.1	What Is Acoustic Cavitation?	1
1.2	Power Ultrasound and Diagnostic Ultrasound	3
1.3	Ultrasonic Transducers	4
1.4	Ultrasonic Horn and Bath	6
1.5	Traveling and Standing Waves	9
1.6	Transient and Stable Cavitation	14
1.7	Vaporous and Gaseous Cavitation	16
1.8	Bubble Structures	17
1.9	Sonoluminescence	19
1.10	Sonochemistry	26
1.11	Ultrasonic Cleaning	29
	References	31
<b>2</b>	<b>Bubble Dynamics</b>	<b>37</b>
2.1	Rayleigh–Plesset Equation	37
2.2	Rayleigh Collapse	41
2.3	Keller Equation	42
2.4	Method of Numerical Simulations	47
2.5	Non-equilibrium Evaporation and Condensation	51
2.6	Liquid Temperature at the Bubble Wall	53
2.7	Gas Diffusion (Rectified Diffusion)	54
2.8	Chemical Kinetic Model	56
2.9	Single-Bubble Sonochemistry	56
2.10	Main Oxidants	61
2.11	Effect of Volatile Solutes	64
2.12	Resonance Radius	68
2.13	Shock Wave Emission	73
2.14	Shock Formation Inside a Bubble	75
2.15	Jet Penetration Inside a Bubble	76

2.16	Radiation Forces (Bjerknes Forces) . . . . .	78
2.17	Effect of Salts and Surfactants . . . . .	83
2.18	Bubble–Bubble Interaction . . . . .	84
2.19	Acoustic Cavitation Noise . . . . .	86
2.20	Acoustic Streaming and Microstreaming . . . . .	92
	References . . . . .	93
<b>3</b>	<b>Unsolved Problems</b> . . . . .	99
3.1	Cavitation Nuclei (Bulk Nanobubbles) . . . . .	99
3.2	Ammonia (NH <sub>3</sub> ) Formation . . . . .	106
3.3	Solidification and Sonocrystallization . . . . .	107
3.4	A Hot Plasma Core . . . . .	108
3.5	Ionization-Potential Lowering . . . . .	110
3.6	OH-Line Emission . . . . .	112
3.7	Acoustic Field . . . . .	116
3.8	Effect of a Magnetic Field . . . . .	116
3.9	Role of Oxygen Atoms . . . . .	117
3.10	Extreme Conditions in a Dissolving Bubble . . . . .	117
3.11	Concluding Remarks (Modeling Complex Phenomena) . . . . .	118
	References . . . . .	118

Acoustic Cavitation and Bubble Dynamics

Yasui, K.

2018, VIII, 124 p. 84 illus., Softcover

ISBN: 978-3-319-68236-5