1. Record Nr. UNINA9910792224703321

Titolo	Power ultrasonics : applications of high-intensity ultrasound / / edited by Juan A. Gallego-Juarez, Karl F. Graff
Pubbl/distr/stampa	Waltham, Massachusetts : , : Elsevier, , 2015 ©2015
ISBN	1-78242-036-3 1-78242-028-2
Edizione	[First edition.]
Descrizione fisica	1 online resource (1167 p.)
Collana	Woodhead Publishing Series in Electronic and Optical Materials ; ; Number 66
Disciplina	620.28
Soggetti	Ultrasonic waves - Industrial applications High-intensity focused ultrasound
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Front Cover; Power Ultrasonics: Applications of High-intensity Ultrasound; Copyright; Contents; List of contributors; Woodhead Publishing Series in Electronic and Optical Materials; Chapter 1: Introduction to power ultrasonics; 1.1. Introduction; 1.2. The field of ultrasonics; 1.3. Power ultrasonics; 1.4. Historical notes; 1.5. Coverage of this book; Part One: Fundamentals; Chapter 2: High-intensity ultrasonic waves in fluids: nonlinear propagation and effects; 2.1. Introduction; 2.2. Nonlinear phenomena; 2.2.1. Basic equations: acoustic, entropy, and vorticity modes 2.2.2. Scope of nonlinear acoustics2.3. Nonlinear interactions within the acoustic mode; 2.3.1. Simple waves; 2.3.2. Quadratic approximation; 2.3.3. Nonlinear distortion and shock formation; 2.3.4. Shock structure; 2.3.5. Intense acoustic fields radiated by finite-aperture sources; 2.3.6. Formation of high-intensity ultrasound fields using focusing; 2.4. Nonlinear interactions between the acoustic and nonacoustic modes; 2.4.1. General remarks; 2.4.2. Acoustic streaming and radiation force; 2.4.3. Medium heating due to absorption of acoustic waves; 2.4.4. Heat release at a shock 2.5. ConclusionChapter 3: Acoustic cavitation: bubbledynamics in high-

powerultrasonic fields; 3.1. Introduction; 3.2. Cavitation thresholds; 3.2.1. Static tension threshold; 3.2.2. Acoustic cavitation threshold; 3.3. Single-bubble dynamics; 3.3.1. Bubble models; 3.3.2. Response curves; 3.3.2.1. Low driving; 3.3.2.2. High driving; 3.3.3. Parameter space diagrams; 3.3.4. Bubble habitat; 3.3.5. Single-bubble dynamics: examples; 3.3.5.1. Sound radiation; 3.3.5.2. Deformation, splitting, and merging; 3.3.5.3. Jet formation; 3.4. Bubble ensemble dynamics; 3.4.1. Bubble clusters
3.4.2. Bubble filaments3.4.3. Bubble double layers; 3.4.4. Bubble cones; 3.4.5. N-bubble model; 3.4.6. N-bubble simulation examples; 3.5. Acoustic cavitation noise; 3.5.1. Subharmonics and period doubling; 3.5.2. Synchronization; 3.5.3. Bubble splitting; 3.6. Sonoluminescence; 3.7. Conclusions; Chapter 4: High-intensity ultrasonic waves in solids: nonlinear dynamicsand effects; 4.1. Introduction; 4.2. Fundamental nonlinear equations; 4.2.1. Constitutive equations and equation of motion; 4.2.2. Approximate analytical solutions; 4.2.2.1. Applications
4.2.3. Isotropic solids and wave number modulation4.2.3.1. Applications; 4.3. Nonlinear effects in progressive and stationary waves; 4.3.1. Harmonic balance in progressive waves: dispersion and attenuation; 4.3.2. Frequency mixing; 4.3.2.1. Applications; 4.3.3. Stationary waves: nonlinear sources; 4.3.3.1. Applications; 4.4. Conclusions; Chapter 5: Piezoelectric ceramic materials for power ultrasonic transducers; 5.1. Introduction; 5.2. Fundamentals of ferro-piezoelectric ceramics; 5.2.1. From the ferroelectric single-crystal to the ceramic; 5.2.2. Ferroelectric hysteresis and domains
5.2.3. The poling process

Sommario/riassunto

The industrial interest in ultrasonic processing has revived during recent years because ultrasonic technology may represent a flexible “green alternative for more energy efficient processes. A challenge in the application of high-intensity ultrasound to industrial processing is the design and development of specific power ultrasonic systems for large scale operation. In the area of ultrasonic processing in fluid and multiphase media the development of a new family of power generators with extensive radiating surfaces has significantly contributed to the implementation at industrial scale of several applications in sectors such as the food industry, environment, and manufacturing. Part one covers fundamentals of nonlinear propagation of ultrasonic waves in fluids and solids. It also discusses the materials and designs of power ultrasonic transducers and devices. Part two looks at applications of high power ultrasound in materials engineering and mechanical engineering, food processing technology, environmental monitoring and remediation and industrial and chemical processing (including pharmaceuticals), medicine and biotechnology. Covers the fundamentals of nonlinear propagation of ultrasonic waves in fluids and solids. Discusses the materials and designs of power ultrasonic transducers and devices. Considers state-of-the-art power sonic applications across a wide range of industries.