The Acoustic Bubble

The acoustic effects of air bubbles in water have been investigated in various fields of physics in recent years, and bubble-generated sound radiation has been observed in various applications such as acoustic imaging and medical ultrasound. The detection of bubble densities in underwater environments can be performed using dual-frequency techniques, which allow accurate and non-invasive bubble detection and quantification.

In this thesis, a novel method for bubble detection has been developed and tested. The method utilizes a high-frequency ultrasound signal to excite the bubbles, which then act as acoustic sources. The scattered sound signals are then detected by an acoustic receiver, and the bubble density is determined from the intensity of the scattered sound signals. The method is non-invasive, fast, and highly accurate.

A high-speed imaging system has been used to record the bubble dynamics, and the results have been compared with the theoretical predictions. The agreement between theory and experiment is good, and the method has been successfully applied to various underwater environments, including acoustic cavitation and sonochemistry.

The results of this thesis have been used to optimize sonochemical processes, and as such the book is useful for specialists (researchers, engineers, PhD students etc.) working in the wide area of ultrasonic processing.

The thesis concludes with an extensive discussion of the fundamentals of ultrasonic bubble dynamics, including the effects of ultrasound frequency and bubble size on bubble behavior. The book is a valuable resource for researchers and engineers in the field of ultrasonic processing.
The Acoustic Bubble Academic Press

This brief explains in detail fundamental concepts in acoustic cavitation and bubble dynamics, and describes derivations of the fundamental equations of bubble dynamics in order to support those readers just beginning research in this field. Further, it provides an in-depth understanding of the physical basis of the phenomena. With regard to sonochemistry, the brief presents the results of numerical simulations of chemical reactions inside a bubble under ultrasound, especially for a single-bubble system and including dissolved species. Written so as to be accessible both with and without prior knowledge of fundamental fluid dynamics, the brief offers a valuable resource for students and researchers alike, especially those who are unfamiliar with this field. A grasp of fundamental undergraduate mathematics such as partial derivative and fundamental integration is advantageous; however, even without any background in mathematics, readers can skip the equations and still understand the fundamental physics of the phenomena using the book’s wealth of illustrations and figures. As such, it is also suitable as an introduction to the field.

Traditional food and bioprocessing technologies are facing challenges due to high expectation from the consumers and producers for better quality and safety, higher process efficiency, and products with novel properties or functionalities. For this reason, in the last few years new forms of physical energies have been explored to propose alternatives to traditional processing technologies. Acoustic energy has the potential to replace or partially substitute conventional processes, and at the same time offer unique opportunities in the characterization of foods and biomaterials. This book is a resource for experts and newcomers in the field of power ultrasound, giving insights into the physical principles of this technology, details the latest advancements, and links them to current and potential applications in the food and bioprocessing related industries.

Controlled and Selective Micropropulsion and Chemical Waveforms Generator
Characterization of Cavitation Bubbles and Sonoluminescence
Acoustic Bubble Sizing, Using Active and Passive Techniques to Compare Ambient and Entrained Populations
Cavitation and Bubble Dynamics
Active and Passive Acoustic Bubble Sizing
The Acoustic Bubble describes the interaction of acoustic fields with bubbles in liquid. The book consists of five chapters. Chapter 2 provides classic introduction to acoustics, including some of the more exotic phenomena that can be seen when high-frequency high-intensity underwater sound is employed. Chapter 2 discusses the nucleation of cavitation and basic fluid dynamics, while Chapter 3 draws together the acoustics and bubble dynamics to discuss the free oscillation of a bubble and acoustic emissions from such activity. The acoustics probe that is often applied to study the behavior of a bubble when an externally applied acoustic field drives it into oscillation is detailed in Chapter 4. The last chapter outlines a variety of effects associated with acoustically induced bubble activity. The bubble detection, sonochemistry, sonochemistry, and pulse enhancement are also covered. This publication is a good reference for physics and engineering students and researchers intending to acquire knowledge of the acoustic interaction of acoustic fields with bubbles.

The aim of this handbook is to summarize the recent developments in the topic of ultrasonics and sonochemistry, especially in the areas of functional materials and processing applications. This handbook will benefit the readers as a full and quick technical reference with a high-level historic review of technology, detailed technical descriptions and the latest practical applications. This handbook is divided into five main sections: fundamentals of ultrasonics and sonochemistry, biomaterials, food processing, catalysis, wastewater remediation. Each section introduces by reputable international authors and industrial experts. The handbook comprehensively covers the fundamentals of sonochemistry along with key applications. The handbook strives to be a self-contained, easily understandable reference that will also include up to date knowledge based on research articles. This handbook serves to provide a quick and reliable knowledge for new comers from chemistry, bioengineering, food processing, environmental engineering, in both academia and industrial fields. Individual traveling cavitation bubbles generated on two axisymmetric headforms were detected using a surface electrode probe. The growth and collapse of the bubbles, almost all of which were quasi-spherical caps moving close to the headform surface, were studied photographically. Although the growth patterns for the two headforms were similar, the collapse mechanisms were quite different. These differences were related to the pressure fields and vortex flow patterns associated with each headform. Measurements of the acoustic impulse generated by the bubble collapse were analyzed and found to correlate with the maximum volume of the bubble for each headform. Numerical solutions of the Mayle-Philipson equation were generated for the same flows and compared with the experimental data. The experiments revealed that for smaller bubbles the impulse-volume relationship is determinate, but for larger bubbles the impulse become more uncertain. The theoretical impulse was at least a factor of two greater than the measured impulses, and the impulse-volume relationship was related to the details of the collapse mechanism. A conical emission of individual cavitation events was spectrally analyzed and the results were compared with relevant theoretical and empirical predictions. Finally, the cavitation noise flux was measured and compared with the cavitation event rate and the bubble maximum size distribution through the use of a simple model. Theses. (JHD).

Oceanic Acoustic Modelling: Bubbles
The Acoustic Bubble
A cavitation bubble enhanced pinched flow fractionation for microparticle separation
Acoustic Bubble Detection: Acoustic-Optical Imaging Techniques for Decompression Studies
Acoustic Cavitation and Bubble Dynamics