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# An Overview of Ultrasonic Technology and Its Applications in Food Processing, Preservation and Quality Control

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## ABSTRACT

Ultrasound is one of the emerging technologies that were developed to minimize processing, maximize quality and ensure the safety of food products. In recent years, ultrasound technology has been used as an alternative processing option to conventional thermal approaches. Although Ultrasonication methods have been used for years in research and diagnostics, major advances have been made in the last decade. The applications for which high power ultrasound can be used range from existing processes that are enhanced by the retrofitting of high power ultrasonic technology, to the development of processes up to now not possible with conventional energy sources. The present paper reviews the generation, principle mechanism, properties, process parameters, applications, merits and demerits and future trends of the ultrasound technology in the food processing.

*Keywords: Ultrasound; quality; food processing; preservation; food safety.*

## 1. INTRODUCTION

The trend of production of prolonged shelf-life foods which are fresh like is nowadays preference of consumers. Environmental friendly, green novel technologies are nowadays interest of industry due to the expectations of consumers. Instead of traditional food spoilage control processes, the growing demand to prolong the shelf-life of fresh-like foods with mild preservation techniques such as refrigeration, mild heating, modified atmosphere packaging, irradiation, high pressure, pulsed electric fields, pulsed white light, ultrasound, ultraviolet radiation and the use of natural antimicrobial systems are preferred [1]. Ultrasound is one of the emerging technologies that were developed to minimize processing, maximize quality and ensure the safety of food products. In recent years, ultrasound technology has been used as an alternative processing option to conventional thermal approaches. Ultrasonication can pasteurize and preserve foods by inactivating many enzymes and microorganisms at mild temperature conditions, which can improve food quality in addition to guaranteeing stability and safety of foods. In addition, the changes to the physical properties of ultrasound, such as scattering and attenuation caused by food materials have been used in food quality assurance applications. Ultrasound is composed of sound waves with frequency beyond the limit of human hearing. By tuning frequency, ultrasound can be utilized in many industrial applications including food. Ultrasound techniques are relatively cheap, simple and energy saving, and thus became an emerging technology for probing and modifying food products.

The use of acoustic energy in food or bio-processing operations is relatively new when compared to other sources of energy, such as mechanical or thermal, which have been utilized for centuries in various applications. Two important factors make current ultrasound assisted processes possible: (a) the development in more scalable ultrasound generation technology in the last 20–30 years and (b) the better understanding of interactions between acoustic energy and food materials. In general, ultrasound refers to acoustic pressure waves with frequencies of 20 kHz or higher. Most effects of

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