TRINITY COLLEGE FOR WOMEN NAMAKKAL

Department of Physics

PROPERTIES OF MATTER AND SOUND

23UPH01-ODD Semester

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UITRASONICS

- Ultrasonic waves are sound waves with a frequency higher than 20,000 hertz (Hz), which is beyond the range of human hearing:
- Ultrasonic waves are mechanical waves that can travel through solids, liquids, and gases.
- They can be reflected and refracted, and are 100,000 times slower than electromagnetic waves.

PROPERTIES OF ULTRASONICS

Ultrasonic waves are sound waves with frequencies higher than 20,000 hertz (Hz), which is above the range of human hearing. Some of their properties include:

Speed

Ultrasonic waves are about 100,000 times slower than electromagnetic waves.

Propagation

Ultrasonic waves can travel through solids, liquids, and gases, and can be reflected and refracted.

Focusing

Ultrasonic waves can be focused onto small areas because of their short wavelength.

Imaging

Ultrasonic waves can be used to image materials, similar to visible light.

Types

There are several types of ultrasonic waves, including longitudinal, transverse, and surface waves.

PRODUCTION OF ULTRASONIC WAVE

Ultrasonic waves are produced by the following methods

- (1) Magneto-striction generator or oscillator
- (2) Piezo-electric generator or oscillator

Ultrasonic waves are sound waves with frequencies above 20,000 Hz. They can be produced in a number of ways, including:

Sonography

A non-invasive diagnostic procedure that uses high frequency sound waves to create images of internal organs and blood flow

Ultrasonic mixing

A cost-effective and efficient technology for biodiesel production. Ultrasonic cavitation improves mass transfer, which reduces production costs and processing time.

Ultrasonic cleaning

An ultrasonic generator emits a high-frequency oscillation signal, which is converted into a mechanical oscillation by a transducer. This oscillation is then propagated to a cleaning solvent, producing tiny air bubbles.

- **Ultrasonic welding**
- An environmentally friendly technology that uses up to 75% less energy than other bonding methods. It doesn't require any consumables, making it possible to create glue-free diapers.
- **Graphene dispersions**
- Strong ultrasonic treatment of microscopic graphitic particles can create thin graphite flakes and graphene sheets dispersion.
- **Milk homogenization and pasteurization**
- Ultrasound can be used to pasteurize and homogenize milk in one step. The milk will be whiter, more stable, and more homogenized after processing.

PIEZO ELECTRIC METHOD

The piezoelectric method in ultrasonics uses piezoelectric materials to generate and detect ultrasonic waves:

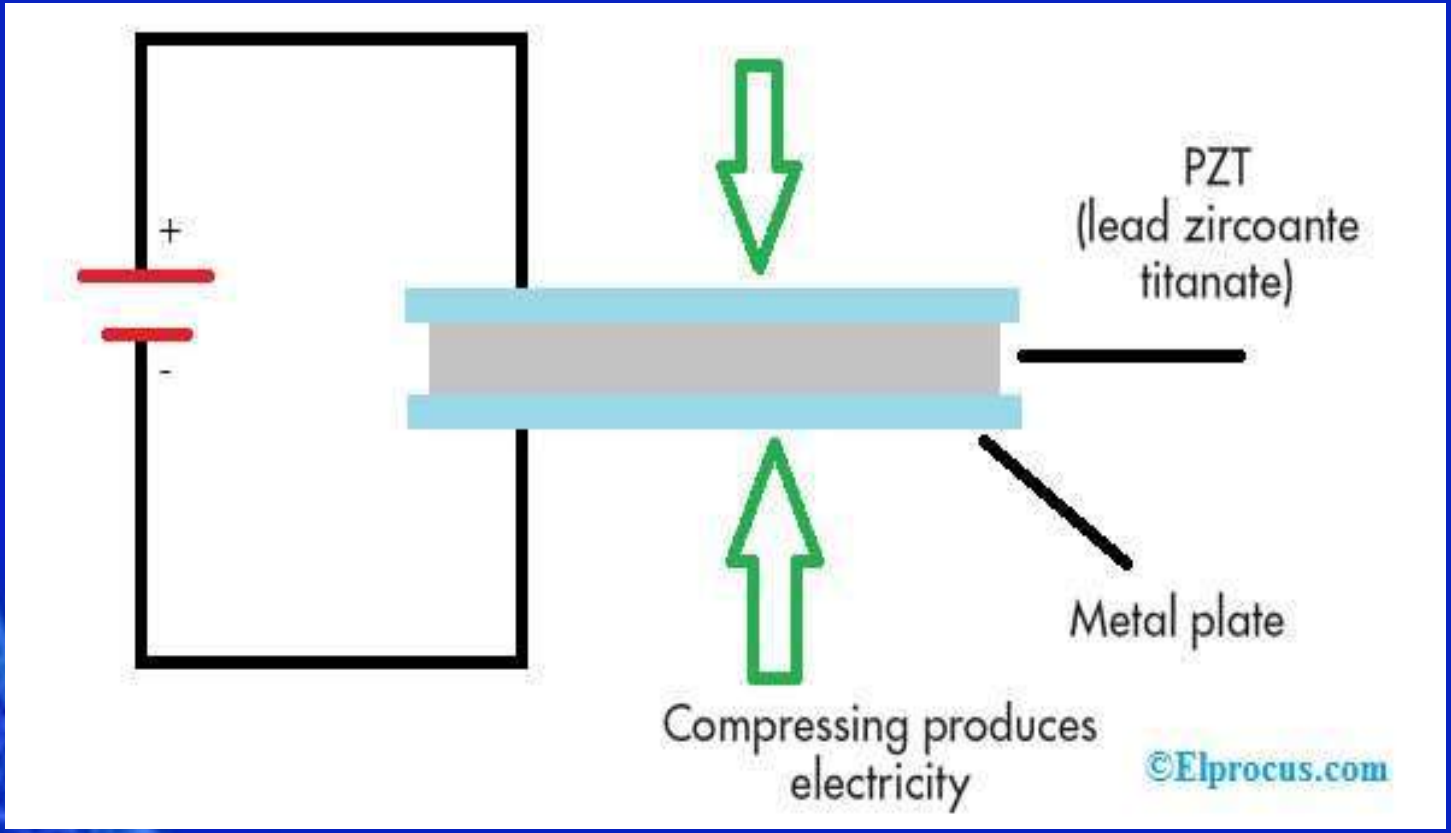
Explanation

Piezoelectric materials produce an electric charge when deformed by stress, and can deform themselves when subjected to an electric field. The piezoelectric method uses these properties to generate and detect ultrasonic waves:

Generation: An electrical signal generator sends a pulse of electrical energy to a piezoelectric crystal in a transducer. The crystal vibrates, converting the electrical pulses into mechanical vibrations, which produce ultrasonic waves.

Detection: Piezoelectric devices can also register mechanical energy, such as sound, and convert it into electrical energy.

PIEZO ELECTRIC METHOD



Application of ultrasonics

Ultrasound is used in many different fields such as

- Navigation
- medicine
- imaging
- cleaning
- mixing
- communication
- testing etc.

THANK YOU

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