
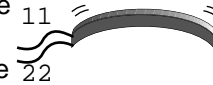
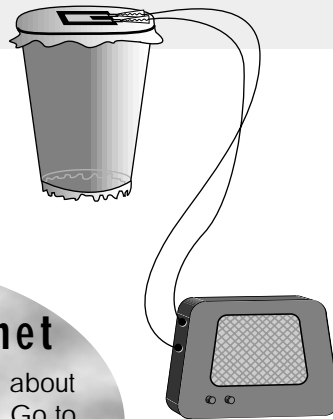


Background Information

Piezoelectric films are used in many audio systems. The films can convert vibrations into proportional electrical signals for use in microphones. Conversely, when electric fields are passed through a piezoelectric film, the film is set into motion in proportion to the variation of the field, making piezoelectric films useful in speakers. A sound-producing or sound-sensing device usually vibrates within the human auditory range of 20 to 20,000 Hz. Piezoelectric film has a capacity to vibrate within these frequencies, although it is most effective between 20 and 2000 Hz. Piezo materials are often used in microphones because of their sensitivity and small size.

vibrate the PVDF film  get a voltage change the voltage  make the PVDF film vibrate

The piezo film microphone is fairly similar to the human ear. Both systems have an air vibration detector, a component that translates these vibrations into an electrical signal, and a component to interpret or produce the sound. Human-made systems using piezoelectric film can be designed to perform beyond the frequency and intensity range of human hearing. A good example might be systems that detect sounds within a remote room by sensing mini-vibrations in the room's window glass.



Portfolio Project

Have interested students think of the ideal sound system they would design if they could, and have them sketch the components and how they connect to each other. They could create exploded views of individual components and otherwise develop a striking visual presentation. Encourage students to then indicate where piezoelectric film might contribute to the success of their systems.

Using the Internet

You can find out a great deal about sound systems on the Internet. Go to an Internet search engine and use the key words **sound systems**, **sound technology**, and **sound engineering**.

Tips from the Trenches

You can add a demonstration to this activity to show that the piezo effect is reversible. Use a portable CD player or radio with jacks intended to run speakers, and connect leads from those jacks to an amplifier. Connect the amplifier to a large piece of PVDF film attached to a balloon. Turn on the CD player or radio, and the balloon will act as a speaker instead of as a microphone, converting the electrical signal it receives into audible sound.

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Sensors and Sound Systems to Different Subjects

Physics

Electrical forces
 Electric circuits
 Relationship between electricity and magnetism
 Interactions of energy and matter
 Sound waves p. 10
 Frequency

Technical Education

Sound systems
 Amplifiers