

Application of the Acoustic Characteristics of Piezoelectric Polymer Materials

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The acoustic characteristics of piezoelectric PVDF polymer films have been studied. A single sheet of PVDF film was bent and mounted on the surface of an acrylic circular cylinder with a rectangular hole. The film was considered as a part of the cylindrical shell and the analysis was made applying the "Shell Theory". From this theory a mathematical model which can explain the vibrational phenomena of the PVDF film was established and verified by examining the frequency response of the sound pressure level.

The eigenfunctions well described the generally expected vibration modes of fixed edge beams. The frequency response curves showed low limit resonance frequencies above 2 kHz, thus PVDF was found to be better suitable for a high frequency range transducer.

The low limit resonance frequencies decrease while the upper limit resonance frequencies increase as the radius of curvature and arc length increase. Thus it can be seen that the effective frequency ranges were broad.