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# Acoustic wave propagation in cubic piezoelectric semiconductor plates

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Piezoelectric materials can be either dielectric or semiconductors. An acoustic wave propagating in a piezoelectric crystal is usually accompanied by an electric field. When the crystal is also a semiconductor, the electric field produces currents and space charges, resulting in dispersion and acoustic loss. The interaction between a travelling acoustic wave and mobile charges in piezoelectric semiconductors is currently called the acoustoelectric effect. It was shown experimentally and proved theoretically that an acoustic wave travelling in a piezoelectric semiconductor can be amplified by the application of an initial dc electric field. Piezoelectric semiconductors devices often have structural design of plates or rods. Here we study the thin piezoelectric semiconductor plates. Two-dimensional equations for coupled extensional, flexural and thickness-shear motions are obtained systematically from the three-dimensional equations by retaining lower order terms in power series expansions in the plate thickness coordinate. The two-dimensional equations are specialized to crystals of cubic (43m) symmetry. Propagation of extensional, flexural and thickness-shear waves and their amplification by a dc electric field are analyzed.