

1. Record Nr.	UNINA9910974928703321
Autore	Yang Jiashi <1956->
Titolo	Analysis of piezoelectric devices / / Jiashi Yang
Pubbl/distr/stampa	Hackensack, NJ, : World Scientific, c2006
ISBN	9786611373078 9781281373076 1281373079 9789812773180 9812773185
Edizione	[1st ed.]
Descrizione fisica	xv, 520 p. : ill
Disciplina	537/.2446
Soggetti	Piezoelectric devices - Mathematical models
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Title from title screen.
Nota di bibliografia	Includes bibliographical references (p. 491-500) and index.
Nota di contenuto	ch. 1. Three-dimensional theories. 1.1. Nonlinear electroelasticity for strong fields. 1.2. Linear piezoelectricity for infinitesimal fields. 1.3. Linear theory for small fields superposed on a finite bias. 1.4. Cubic theory for weak nonlinearity -- ch. 2. Thickness-shear modes of plate resonators. 2.1. Static thickness-shear deformation. 2.2. Nonlinear thickness-shear deformation. 2.3. Effects of initial fields on thickness-shear deformation. 2.4. Linear thickness-shear vibration. 2.5. Effects of electrode inertia. 2.6. Inertial effects of imperfectly bounded electrodes. 2.7. Effects of electrode inertia and shear stiffness. 2.8. Nonlinear thickness-shear vibration. 2.9. Effects of initial fields on thickness-shear vibration -- ch. 3. Slowly varying thickness-shear modes. 3.1. Exact waves in a plate. 3.2. An approximate equation for thickness-shear waves. 3.3. Thickness-shear vibration of finite plates. 3.4. Energy trapping in mesa resonators. 3.5. Contoured resonators. 3.6. Energy trapping due to material inhomogeneity. 3.7. Energy trapping by electrode mass. 3.8. Effects of non-uniform electrodes. 3.9. Effects of electromechanical coupling on energy trapping. 3.10. Coupling to flexure. 3.11. Coupling to face-shear and flexure. 3.12. Effects of middle surface curvature -- ch. 4. Mass sensors. 4.1. Inertial effect of a mass layer by perturbation. 4.2. Thickness-shear modes of a

plate. 4.3. Anti-plane modes of a wedge. 4.4. Torsional modes of a conical shell. 4.5. Effects of inertia and stiffness of a mass layer by perturbation. 4.6. Effects of inertia and stiffness of a mass layer by variation. 4.7. Radial modes of a ring. 4.8. Effects of shear deformability of a mass layer. 4.9. Thickness-shear modes of a plate with thick mass layers. 4.10. An ill-posed problem in elasticity for mass sensors. 4.11. Thickness-shear modes of a circular cylinder. 4.12. Mass sensitivity of surface waves. 4.13. Thickness-twist waves in a ceramic plate. 4.14. Bechmann's number for thickness-twist waves. 4.15. Thickness-twist waves in a quartz plate -- ch. 5. Fluid sensors. 5.1. An ill-posed problem in elasticity for fluid sensors. 5.2. Perturbation analysis. 5.3. Thickness-shear modes of a plate. 5.4. Torsional modes of a cylindrical shell. 5.5. Thickness-shear modes of a circular cylinder. 5.6. Surface wave fluid sensors. 5.7. Thickness-twist waves in a ceramic plate -- ch. 6. Gyroscopes - frequency effect. 6.1. High frequency vibrations of a small rotating piezoelectric body. 6.2. Propagation of plane waves. 6.3. Thickness vibrations of plates. 6.4. Propagating waves in a rotating piezoelectric plate. 6.5. Surface waves over a rotating piezoelectric half-space -- ch. 7. Gyroscopes - charge effect. 7.1. A rectangular beam. 7.2. A circular tube. 7.3. A beam bimorph. 7.4. An inhomogeneous shell. 7.5. A ceramic ring. 7.6. A concentrated mass and ceramic rods. 7.7. A ceramic plate by two-dimensional equations. 7.8. A ceramic plate by zero-dimensional equations -- ch. 8. Acceleration sensitivity. 8.1. Deformation of a quartz plate under normal acceleration. 8.2. First-order acceleration sensitivity. 8.3. An estimate of second-order acceleration sensitivity and its reduction. 8.4. Second-order perturbation analysis. 8.5. Second-order normal acceleration sensitivity. 8.6. Effects of middle surface curvature. 8.7. Vibration sensitivity -- ch. 9. Pressure sensors. 9.1. A rectangular plate in a circular cylindrical shell. 9.2. A circular plate in a circular cylindrical shell. 9.3. A rectangular plate in a shallow shell. 9.4. A bimorph. 9.5. Surface wave pressure sensors based on extension. 9.6. Surface wave pressure sensors based on flexure -- ch. 10. Temperature sensors. 10.1. Thermoelectroelasticity. 10.2. Linear theory. 10.3. Small fields superposed on a thermal bias. 10.4. Thickness-shear modes of a free plate. 10.5. Thickness-shear modes of a constrained plate -- ch. 11. Piezoelectric generators. 11.1. Thickness-stretch of a ceramic plate. 11.2. A circular shell. 11.3. A beam bimorph. 11.4. A spiral bimorph. 11.5. Nonlinear behavior near resonance -- ch. 12. Piezoelectric transformers. 12.1. A thickness-stretch mode plate transformer. 12.2. Rosen transformer. 12.3. A thickness-shear mode transformer - free vibration. 12.4. A thickness-shear mode transformer - forced vibration -- ch. 13. Power transmission through an elastic wall. 13.1. Formulation of the problem. 13.2. Theoretical analysis. 13.3. Numerical results -- ch. 14. Acoustic wave amplifiers. 14.1. Equations for piezoelectric semiconductors. 14.2. Equations for a thin film. 14.3. Surface waves. 14.4. Interface waves. 14.5. Waves in a plate. 14.6. Gap waves.

Sommario/riassunto

This is the most systematic, comprehensive and up-to-date book on the theoretical analysis of piezoelectric devices. It is a natural continuation of the author's two previous books: ?An Introduction to the Theory of Piezoelectricity? (Springer, 2005) and ?The Mechanics of Piezoelectric Structures? (World Scientific, 2006). Based on the linear, nonlinear, three-dimensional and lower-dimensional structural theories of electromechanical materials, theoretical results are presented for devices such as piezoelectric resonators, acoustic wave sensors, and piezoelectric transducers. The book reflects the contribution to the field from Mindlin's school of applied mechanics

researchers since World War II.
