



# Literaturverzeichnis

- [**ABV 93**] Abschlußbericht zum BMFT-Verbundprojekt: Einsatz der Mikromechanik zur Herstellung frequenzanaloger Sensoren, VDI-VDE IT GmbH, Berlin (1993)
- [**Adler 89**] E.L. Adler, Electromechanical coupling to Lamb and shear-horizontal modes in piezoelectric plates, IEEE Trans. on UFFC, Vol. 36, No. 2 (1989) 223–230
- [**Alavi 92a**] M. Alavi, S. Büttgenbach, A. Schumacher, H.-J. Wagner, Fabrication of microchannels by laser machining and anisotropic etching of silicon, Sensors and Actuators A, 32 (1992) 299–302
- [**Alavi 92b**] M. Alavi, Th. Fabula, A. Schumacher, H.-J. Wagner, Monolithic Microbridges in Silicon Using Laser Machining and Anisotropic Etching, EUROSENSORS VI, San Sebastian (1992)
- [**Alavi 93**] M. Alavi, Th. Fabula, A. Schumacher, H.-J. Wagner, Monolithisch integriertes Halbleiterelement, dessen Verwendung sowie Verfahren zur Herstellung eines solchen Halbleiterelementes, Deutsche Patentanmeldung, Aktenzeichen: P 43 32 653.6 vom 24. September 1993
- [**Albert 84**] W.C. Albert, Force sensing using quartz crystal flexure resonator, Proc. 38th. ann. Freq. Contr. Symp., S.233 (1984) 233–239
- [**Allik 70**] H. Allik, T.J.R. Hughes, Finite element method for piezoelectric vibration, Int. Journal for Numerical Methods in Engineering, Vol. 2 (1970) 151–157
- [**Andres 88**] M.V. Andres, K.W.H. Foulds and M.J. Tudor, Sensitivity and mode spectrum of a frequency-output silicon pressure sensor, Sensors and Actuators, 5 (1988) 417–426
- [**Bach 93**] W.H. Bach, persönliche Mitteilungen (1993)
- [**Bartuch 93**] H. Bartuch, S. Büttgenbach, Th. Fabula, H. Weiss, Resonante Silizium-Sensoren mit elektrothermischer Anregung und DMS in Metaldünnschichttechnologie, SENSOR 93, Nürnberg, 11.–14. Oktober (1993) 17–24
- [**Bathe 92**] K.J. Bathe, Finite element procedures in engineering analysis, Prentice Hall Inc., Englewood Cliffs, New Jersey (1982) und deutsche Ausgabe: Finite-Elemente-Methoden, Springer-Verlag, Berlin (1990)

- [**Becker 86**] E.W. Becker, W. Ehrfeld, P. Hagmann, A. Maner, D. Münchmeyer, Fabrication of microstructures with high aspect ratios and great structural heights by synchrotron radiation lithography, galvanofforming, and plastic moulding (LIGA process), *Microelectronic Eng.* 4 (1986) 35
- [**Bin 87**] T.Y. Bin, R.S. Huang, CAPSS: a thin diaphragm capacitive pressure sensor simulator, *Sensors and Actuators* 11 (1987), 1–22
- [**Blevins 84**] R.D. Blevins, *Formulas for natural frequency and mode shapes*, Krieger Publishing Company, Malabar/Florida (1984)
- [**Blom 90**] F.R. Blom, Resonant silicon beam force sensor, Dissertation, Universität Twente, Enschede, Niederlande (1990) und *Sensors and Actuators* A21–23 (1990) 226
- [**Boley 85**] B.A. Boley, J.H. Weiner, *Theory of thermal stresses*, R.E. Krieger Publishing Comp., John Wiley and Sons (1985)
- [**Boucher 81**] D. Boucher, M. Lagier, C. Maerfeld, Computation of the vibrational modes for piezoelectric array transducers using a mixed finite element-perturbation method, *IEEE Trans. on sonics and ultrasonics*, Vol. SU-28, No. 5 (1981) 318–330
- [**Bouwstra 90**] S. Bouwstra, Resonating microbridges mass flow sensor, Dissertation, Universität Twente, Enschede, Niederlande (1990)
- [**Bouwstra 91**] S. Bouwstra, B. Geijselaers, On the resonance frequencies of microbridges, *Proc. TRANSDUCERS '91, Digest of technical papers*, San Francisco (1991) 538–542
- [**Braess 91**] D. Braess, *Finite Elemente*, Springer-Verlag, Berlin (1991)
- [**Braxmaier 92a**] C. Braxmaier, Aufbau und Erprobung eines Meßplatzes zur Untersuchung des dynamischen Verhaltens von mikromechanischen Grundstrukturen, Diplomarbeit, FH-Furtwangen / HSG-IMIT, Villingen-Schwenningen (1992)
- [**Braxmaier 92b**] C. Braxmaier, Fremdanregung von Balken durch Dickenschwinger zur Eigenfrequenzbestimmung, Praktikumsarbeit, HSG-IMIT, VS-Villingen (1992)
- [**Brice 85**] J.C. Brice, Crystals for quartz resonators, *Rev. Modern Physics*, Vol. 57, No. 1 (1985) 105
- [**Brissaud 91**] M. Brissaud, Characterization of piezoceramics, *IEEE Trans. on UFFC*, Vol. 38, No. 6 (1991) 603–617
- [**Brombley 83**] : E.I. Brombley, et al., A technique for the determination of stress in thin films, *J. Vac. Sci. Technol.*, Vol. B1(4) (1983) 1369
- [**Büttgenbach 91a**] S. Büttgenbach, *Mikromechanik*, B. G. Teubner, Stuttgart (1991)

- [**Büttgenbach 91b**] S. Büttgenbach, Frequenzanaloge Sensoren, in: Technologietrends in der Sensorik, VDI Bildungswerk, Düsseldorf (1991)
- [**Burrer 93**] Ch. Burrer, J. Esteve, Thermally driven micromechanical bridge resonators, EUROSENSORS VII, Budapest (1993)
- [**Buser 89**] R.A. Buser, Theoretical and experimental investigations on silicon single crystal resonant structures, Dissertation, Universität Neuchatel (1989)
- [**Buser 91**] R.A. Buser, N.F. de Rooij, ASEP: a CAD program for silicon anisotropic etching, Sensors and Actuators A 28, (1991) 71–78
- [**Camon 90**] H. Camon, Micromachining: First development of an atomic scale chemical etching simulator, MME '90, 2nd Workshop on Micromachining Micromechanics and Microsystems, Berlin (1990)
- [**Chau 87**] H.-L. Chau, K.D. Wise, Scaling limits in batch-fabricated silicon pressure Sensors, IEEE Transactions on Electronic Devices, Vol. ED-34, No. 4 (1987) 850–858
- [**Challande 90**] P. Challande, Optimizing ultrasonic transducers based on piezoelectric composites using a finite-element method, IEEE Trans. on UFFC, Vol. 37, No. 2 (1990) 135–140
- [**Char 91**] B.W. Char, K.O. Geddes, G.H. Gonnet, B.L. Leong, M.B. Monagan, S.M. Watt, MAPLE V - Language Reference Manual, Springer-Verlag, New York (1991)
- [**Ciarlet 91**] P.G. Ciarlet, J.L. Lions, (Eds.), Handbook of numerical analysis, Vol. II: Finite Element Methods (Part 1), North-Holland, Amsterdam (1991)
- [**Clayton 87**] L.D. Clayton, S.R. Swanson and E.P. Eernisse, Modifications of the double-ended tuning fork geometry for reduced coupling to its surroundings: finite element analysis and experiment, IEEE Trans. on UFFC 34 (1987) 243–252
- [**COMP**] COMPOSITE, User Manual, Version 1.5, FhG-AIS, Erlangen
- [**Crary 91a**] S.B. Crary, O. Juma, Y. Zhang, Software tools for designers of sensors and actuator CAE Systems, Proc. TRANSDUCERS '91, Digest of technical papers, San Francisco (1991) 498–501
- [**Crary 91b**] S.B. Crary, R.A. Buser, F. Pourahmadi, Short course: modeling of micro-mechanical devices, Proc. TRANSDUCERS '91, Digest of technical papers, San Francisco (1991)
- [**CRC89**] CRC Handbook of Chemistry and Physics, CRC Press, Inc., Boca Raton, Florida, USA 70th edn. (1989)
- [**D'Amico 89**] A. D'Amico, E. Verona, SAW sensors, Sensors and Actuators, 17 (1989) 55–56

- [**Danel 91**] J.S. Danel, G. Delapierre, Anisotropic crystal etching: a simulation program, EUROSENSORS VI, Rome (1991)
- [**Deschanvres 92**] J.L. Deschanvres, P. Rey, G. Delabouglise, M. Labeau, J.C. Joubert, J.C. Peuzin, Characterization of piezoelectric properties of zinc oxide thin films deposited on silicon for sensors applications, Sensors and Actuators A, 33 (1992) 43–45
- [**Dufour 92**] M. Dufour, M.T. Delaye, F. Michel, J.S. Danel, B. Diem, G. Delapierre, A comparison between micromachined pressure sensors using quartz or silicon vibrating beams, Sensors and Actuators A, 34 (1992) 201–209
- [**Eccardt 92**] P.-C. Eccardt, ANSYS-Seminar: Piezoelektrizität, CADFEM GmbH, Ebersberg (1992)
- [**Eer Nisse 88**] E.P. Eernisse, R.W. Ward, R.B. Wiggins, Survey of quartz bulk resonator sensor technologies, IEEE Transactions on UFFC, Vol. 35, No. 3 (1988) 323–330
- [**Engelhardt 89**] W. Engelhardt, Messung der inneren Spannung von Silizium-Membranen, Diplomarbeit, Universität Stuttgart (1989)
- [**Fabula 92a**] Th. Fabula, A. Schroth, Simulation des dynamischen Verhaltens mikromechanischer Membranen, VDI-Fachtagung für Geräte- und Mikrosystemtechnik, TU Chemnitz (1992), VDI-Bericht 960, VDI-Verlag Düsseldorf (1992)
- [**Fabula 92b**] Th. Fabula, Dynamische Berechnungen in der Mikromechanik - Simulation / Messung, 10. ANSYS Users' Meeting, Arolsen, 28.–30.10.1992, CADFEM GmbH, Grafing
- [**Fabula 93a**] Th. Fabula, H.-J. Wagner, B. Schmidt, S. Büttgenbach, Triple beam resonant silicon force sensor based on piezoelectric thin films, EUROSENSORS VII, Budapest (1993), erschienen in: Sensors and Actuators A. Physical, Vol. 42, No. 1–3 (1994) 375–380
- [**Fabula 93b**] Th. Fabula, N. Hey, S. Messner, Gekoppelte Feldberechnung eines mikromechanischen Strömungssensors, 11. CADFEM Users' Meeting, Bamberg, 27.–29.10.1993, CADFEM GmbH, Grafing
- [**FDI**] Fluid Dynamics International, Inc., Evanston, Illinois, USA
- [**Feynman 59**] R. Feynman, There's plenty of room at the bottom, Annual meeting of the american physical society, in: Miniaturization, H.D. Gilbert, Ed., Van Nostrand Reinhold, New York, NY 10003 (1959)
- [**Franz 88**] J. Franz, Piezoelektrische Sensoren auf Siliziumbasis für akustische Anwendungen, VDI-Berichte, Reihe 10: Informatik/Kommunikationstechnik, Nr. 87, VDI-Verlag Düsseldorf (1988)

- [**Friedrich 90**] W. Friedrich, R. Lerch, K. Prestele, R. Soldner, Simulation of piezoelectric Lamb wave delay lines using a finite element method, IEEE Trans. on UFFC, Vol. 37, No. 2 (1990) 248–254
- [**Frühauf 90**] J. Frühauf, Simulation of orientation dependent etching of masked silicon structures (SIMODE), MME '90, 2nd Workshop on Micromachining Micromechanics and Microsystems, Berlin (1990)
- [**Funk 93**] K. Funk, Entwurf und monolithische Integration einer Schaltung für mikro-mechanische Sensoren mit piezoelektrischem Antrieb, Diplomarbeit, TU Chemnitz (1993)
- [**Gagnepain 90**] J.-J. Gagnepain, Resonators, detectors, and piezoelectrics, Academic Press, Inc. (1990), ISBN 0-12-014677-0
- [**Geijselaers 91**] H.J.M. Geijselaers, H. Tjeldeman, The dynamic mechanical characteristics of a resonating microbridge mass-flow sensor, Sensors and Actuators A, 29 (1991) 37–41
- [**Ger?? 81**] Ger??? ... (1981)
- [**Gerdau 94**] R.W. Gerdau, persönliche Mitteilungen (1994)
- [**Gieseler 92**] Gie92 Gieseler ... (1992)
- [**Goldstein 78**] H. Goldstein, Klassische Mechanik, Akademische Verlagsgesellschaft, 5. Auflage, Wiesbaden (1978)
- [**Göhner 93**] U. Göhner, ANSYS-Seminar: Fehleranalyse in der FEM, CADFEM GmbH, Ebersberg (1993)
- [**Grabowski 91**] R. Grabowski, Dünnschichtkurs, FhG-IPM, Freiburg (1991)
- [**Grenwood 88**] J.C. Greenwood, D.W. Satchell, Miniature silicon resonant pressure sensor, IEE Proceedings, Vol. 135, No. 5 (1988) 369–372
- [**Guckel 90**] H. Guckel, J.J. Sniegowski, T.R. Christenson, F. Raissi, The application of finegrained, tensile polysilicon to mechanically resonant transducers, Sensors and Actuators, A21–A23 (1990) 346–351
- [**Hackbusch 86**] W. Hackbusch, Theorie und Numerik elliptischer Differentialgleichungen, B.G. Teubner, Stuttgart (1986)
- [**Haffner 92**] H. Haffner, Untersuchung zu Toleranzen und Fehlern in Lithographie- und Ätzprozessen, Diplomarbeit, TU Chemnitz / HSG-IMIT, Villingen-Schwenningen (1992)
- [**Heiland 66**] Heiland, Ibach, Pyroelectric properties of zinc oxid, Solid State Comm. 4 (1966) 353

- [**Hauden 92**] D. Hauden, M. Hoummady, A. Chonjan, F. Bastien, Elastic wave sensors - quartz technological channel and silicon technology, *Sensors and Actuators A*, 32 (1992) 99–102
- [**Heckmann 25**] G. Heckmann, *Ergeb. exakt Naturwiss.* 4 (1952) 100
- [**Heuberger 89**] A. Heuberger (Hrsg.), *Mikromechanik*, Springer Verlag, Berlin (1989)
- [**Hellwege 88**] K.-H. Hellwege, *Einführung in die Festkörperphysik*, 3. Auflage, Springer-Verlag, Berlin (1988)
- [**Hossack 91**] J.A. Hossack, G. Hayward, Finite-element analysis of 1–3 composite transducers, *IEEE Trans. on UFFC*, Vol. 38, No. 6 (1991) 618–629
- [**Howe 87**] R.T. Howe, Resonant microsensors, *Proc. TRANSDUCERS '87*, Digest of technical papers, Tokio, Japan (1987) 843–848
- [**Ikeda 88**] K. Ikeda, H. Kuwayama, T. Kobayashi, T. Watanabe, T. Nishikawa, T. Yoshida, K. Harada, Silicon pressure sensor with resonant strain gauge built into diaphragm, *Proc. of the 7th Sensor Symposion*, Tokyo, Japan (1988) 55–58
- [**Ikeda 90a**] T. Ikeda, *Fundamentals of Piezoelectricity*, Oxford University Press, Oxford (1990)
- [**Ikeda 90b**] K. Ikeda, H. Kuwayama, T. Kobayashi, T. Watanabe, T. Nishikawa, T. Yoshida, K. Harada, Silicon pressure sensor integrates resonant strain gauge on diaphragm, *Sensors and Actuators*, A21–A23 (1990) 146–150
- [**Jagfeld 91**] M. Jagfeld, G. Müller, K. Schweizerhof, U. Stelzmann, E.K. Wang, *ANSYS-Seminar: Dynamische Berechnungen*, CADFEM GmbH, Ebersberg (1991)
- [**Johnson 91**] B.P. Johnson, S. Kim, J.K. White, S.D. Senturia, J. White, MEMCAD capacitance calculations for mechanically deformed square diaphragm and beam microstructures, *Proc. TRANSDUCERS '91*, Digest of technical papers, San Francisco (1991) 494–497
- [**Kagawa 74**] Y. Kagawa, T. Yamabuchi, Finite element simulation of two-dimensional electromechanical resonators, *IEEE Trans. on Sonics and Ultrasonics*, Vol. SU–21, No. 4 (1974) 275–283
- [**Kagawa76a**] Y. Kagawa, T. Yamabuchi, A finite element approach to electromechanical problems with an application to energy-trapped and surface-wave devices, *IEEE Trans. on Sonics and Ultrasonics*, Vol. SU–23, No. 4 (1976) 263–272
- [**Kagawa 76b**] Y. Kagawa, T. Yamabuchi, Finite element approach for a piezoelectric circular rod, *IEEE Trans. on Sonics and Ultrasonics*, Vol. SU–23, No. 6 (1976) 379–385

- [**Kamins 90**] T.I. Kamins, Design properties of polysilicon crystalline silicon, Sensors and Actuators, A21–A23 (1990) 817–824
- [**Kawamura 87**] Y. Kawamura, K. Sato, T. Terasawa, S. Tanaka, Si cantilever-oscillator as a vacuum sensor, Proc. TRANSDUCERS '87, Digest of technical papers, Tokio, Japan (1987)
- [**Kim 86**] C.S. Kim, S.M. Dickinson, The flexural vibration of slightly curved slender beams subject to axial end displacement, J. of Sound and Vibration, Vol. 104, No. 1 (1986) 170–175
- [**Kim 87**] E.S. Kim, R.S. Muller, IC-Processed piezoelectric microphone, IEEE Electron Device Letters, Vol. EDL-8, No. 10 (1987) 467–468
- [**Kirman 83**] R.G. Kirman, A vibrating quartz force sensor, Transducers TEMPCON Conference Papers, London, 14–16 June (1983) 97–121
- [**Kittel 88**] C. Kittel, Einführung in die Festkörperphysik, 7. Auflage, R. Oldenburg Verlag GmbH München (1988)
- [**Kohnke 92**] P. Kohnke, ed., ANSYS User's Manual for Revision 5.0, Volume IV, Theory, Houston, PA, USA (1992)
- [**Koppelmann 89**] G.M. Koppelmann, OYSTER - a 3D structural simulator for micro electromechanical design, MEMS '89, Salt Lake City (1989), erschienen in: Sensors and Actuators, Vol. 20, (1989) 179
- [**Koide 91**] A. Koide, K. Sato, S. Tanaka, Simulation of twodimensional etch profile of silicon during orientation-dependent anisotropic etching, MEMS '91, Nara, Japan (1991)
- [**Lanceleur 92**] P. Lanceleur, J.F. de Belleval, N. Mercier, Modeling of transient deformation of piezoelectric ceramics, IEEE Trans. on UFFC, Vol. 39, No. 2 (1992) 293–301
- [**Landau 74**] L.D. Landau, E.M. Lifsic, Theoretische Physik, Elastizitätstheorie, Band VII, ungarische Ausgabe: Tankönyvkiado, Budapest (1974)
- [**Landau 85**] R.M. Langdon, Resonator sensors - a review, J.Phys.E:Sci.Instrum., Vol. 18, (1985) 103
- [**Landolt-Börnstein 82**] Landolt-Börnstein, Zahlenwerte und Funktionen aus Naturwissenschaft und Technik, Gruppe III, Band 17a, Berlin, Springer Verlag (1982)
- [**Lee 82**] K.W. Lee, K.D. Wise, SENSIM: A simulation program for solid-state pressure sensors, IEEE Trans. on Electron Devices, Vol. ED-29, No. 1 (1982) 34–41
- [**Lerch 90**] R. Lerch, Simulation of piezoelectric devices by two- and three-dimensional finite elements, IEEE Trans. on UFFC, Vol. 37, No. 2 (1990) 233–247



- [**Lindberg 93**] U. Lindberg, J. Söderkvist, T. Lammerink, M. Elwenspoek, Quasi-buckling of micromachined beams, MME '93 Micro Mechanics Europe (1993) 115–118
- [**Lorenz 85**] J. Lorenz, J. Pelka, H. Ryssel, A. Sachs, A. Seidl, M. Svoboda, COMPOSITE - A Complete Modeling Program of Silicon Technology, IEEE Trans. on CAD, Vol. CAD-4, No. 4 (1985) 1977
- [**Maibach 92**] J. Maibach, D. Maier-Schneider, E. Obermeier, Charakterisierung elastischer Eigenschaften dünner Filme durch Messung der Membrandurchbiegung, VDI-Berichte, Nr. 939 (1992) 369–374
- [**Marsal 89**] D. Marsal, Finite Differenzen und Elemente, Springer Verlag, Berlin (1989)
- [**Marhöfer 90**] Marhöfer, Design tools for the development of MEMS, Micro System Technologies, Berlin (1990)
- [**Martin 90**] B.A. Martin, S.W. Wenzel, R.M. White, Viscosity and density sensing with ultrasonic plate waves, Sensors and Actuators, A21–A23 (1990) 704–708
- [**Matzenmiller 93**] A. Matzenmiller, W. Rust, ANSYS-Seminar Nichtlinearitäten, CAD-FEM GmbH, Grafing (1993)
- [**Meirovitch 67**] L. Meirovitch, Analytical methods in vibrations, Macmillan Publishing Co., Inc., New York (1967)
- [**Meirovitch 86**] L. Meirovitch, Elements of vibration analysis, 2nd Edition, McGraw-Hill Book Co., New York (1986)
- [**Merker87**] G.P. Merker, Konvektive Wärmeübertragung, Springer-Verlag, Berlin (1987)
- [**Messner 93**] S. Messner, Finite-Elemente Berechnung der Fluid-Struktur-Wechselwirkung bei einem mikromechanischen Strömungssensor, Diplomarbeit, Universität Stuttgart / HSG-IMIT, Villingen-Schwenningen (1993)
- [**Middelhoek 89**] S. Middelhoek, S.A. Audet, Silicon sensors, Academic Press Limited, London (1989)
- [**Morten 92**] B. Morten, G. De Cicco, M. Prudenziati, Resonant pressure sensor based on piezoelectric properties of ferroelectric thick films, Sensors and Actuators A, 31 (1992) 153–158
- [**Morton 87**] K.W. Morton, Basic course in finite element methods, in: R. Gruber (ed.): Finite elements in physics, Proc. of the 1st european graduate summer course on computational physics, Lausanne, Switzerland, 1–10 September, North-Holland, Amsterdam (1987)
- [**Muller 87**] R.S. Muller, Micromotors..., TRANSDUCERS '87, Digest of technical papers, Tokio, Japan (1987), 107

- [**Mullem 91**] C.J. van Mullem, F.R. Blom, J.H.J. Fluitman, M. Elwenspoek, Piezoelectrically driven silicon beam force sensor, *Sensors and Actuators A*, 25–27 (1991) 379–383
- [**Müller 92**] M. Iler, Aufbau und Inbetriebnahme eines optischen Meßplatzes zur Charakterisierung von resonanten mikromechanischen Strukturen, Diplomarbeit, FH-Furtwangen / HSG-IMIT, Villingen-Schwenningen (1992)
- [**Muro 92**] H. Muro, H. Kaneko, S. Kiyota, P.J. French, Stress analysis of  $SiO_2/Si$  bi-metal effect in silicon accelerometers and its compensation, *Sensors and Actuators A*, 34 (1992) 43–49
- [**Naillon 83a**] M. Naillon, R.H. Coursant, F. Besnier, Analysis of piezoelectric structures by a finite element method, *Acta electronica*, 25, 4 (1983) 341–362
- [**Naillon 83b**] M. Naillon, F. Besnier, R.H. Coursant, Finite element analysis of narrow piezoelectric parallelepiped vibrations energetical coupling modeling, *Proc. of the ultrasonics symposium*, Oct. 31 - Nov. 2, Atlanta, Georgia, USA (1983) 773–777
- [**Naillon 89**] M. Naillon, F. Besnier, Finite element analysis of piezoelectric structure electro-mechanical response, INTES GmbH, Stuttgart (1989)
- [**Nix 89**] W.D. Nix, Mechanical properties of thin films, *Met. Trans A*, Vol. 20A (1989) 2217
- [**Nye 57**] J.F. Nye, *Physical properties of crystals*, Oxford science publ., Clarendon Press, Oxford (1957)
- [**Ostergaard 89**] D.F. Ostergaard, ANSYS Coupled Field Analysis, Rev. 4.4 Tutorial, Swanson Analysis Systems Inc. (1989)
- [**Olaf 92**] J.M. Olaf, Ein Verfahren zur Bewertung des mechanischen Verhaltens von Randschichten, Dissertation, Universität Freiburg (1992)
- [**Over 77**] H.-H. Over, Elastische und plastische Eigenschaften von einkristallinem Silicium in Abhängigkeit von der Temperatur und der Versetzungsdichte, Dissertation, RWTH Aachen (1977)
- [**Parsons 92**] P. Parsons, A. Glendinning, D. Angelidis, Resonant sensors for high accuracy pressure measurement using silicon technology, *IEEE AES Magazine*, July (1992) 45–48
- [**Paul 75**] R. Paul, *Halbleiterphysik*, Alfred Hüthig Verlag, ?? . Auflage, Heidelberg (1975)
- [**Pfeiffer89**] F. Pfeiffer, *Einführung in die Dynamik*, B.G. Teubner Studienbücher, Stuttgart (1989)
- [**Pichler 90**] P. Pichler, R. Dürr, ICECREAM 4.2, User's Guide, FhG-AIS, Erlangen (1990)

- [**Polla 84**] D.L. Polla, R.S. Muller, R.M. White, Fully-integrated ZnO on silicon pyroelectric infrared detector array, IEDM (1984) 382–384
- [**Polla 86**] D.L. Polla, R.S. Muller, Zinc-oxide thin films for integrated-sensor applications, IEEE Solid State Sensor Workshop, Hilton Head Island, June 1986
- [**Polytec 91**] Bedienungsanleitung: OFV 1102 Laservibrometer, Polytec GmbH, Waldbronn (1991)
- [**Pons 91**] P. Pons, G. Blasquez, Natural vibration frequencies of silicon diaphragms, Proc. TRANSDUCERS '91, Digest of technical papers, San Francisco (1991) 543–546
- [**Páczelt 87**] I. Páczelt, P. Scharle, A végeselem-módszer a kontinuummechanikában, Műszaki Könyvkiadó, Budapest (1987)
- [**Pratt 91**] R.I. Pratt, G.C. Johnson, R.T. Howe, J.C. Chang, Micromechanical structures for thin film characterization, Proc. TRANSDUCERS '91, Digest of technical papers, San Francisco (1991) 205–208
- [**Prak 93**] A. Prak, Silicon Resonant Sensors: Operation and Response, Dissertation, Universität Twente, Enschede, Niederlande (1990)
- [**Preez 90**] R.J. du Preez, Solution of coupled piezoelectric-solid-structure problems with PERMAS, Finite elements in engineering applications, INTES GmbH, Stuttgart (1990) 283–300
- [**Quickert 93**] M. Quickert, Ableitung netzwerktheoretischer Ersatzschaltbilder für piezoelektrische Resonatoren, Diplomarbeit, TU Dresden (1993)
- [**Ramm 90**] E. Ramm, G. Müller, J. Müller, K. Schweizerhof, Dynamische Berechnungen mit der Methode der finiten Elemente, ANSYS-Seminarunterlagen, CAD-FEM GmbH, Ebersberg (1990)
- [**Rankin 84**] C.C. Rankin, F.A. Brogan, An element independent corotational proc. for the treatment of large rotations, Journal of Pressure Vessel Technology, Vol. 108, May (1984) 165–174
- [**Ricco 91**] A.J. Ricco, S.J. Martin, R.M. White, Short course: fundamentals of ultrasonic sensors, TRANSDUCERS '91, San Francisco (1991)
- [**Riethmüller 88**] W. Riethmüller, W. Benecke, Thermally excited silicon microactuators, IEEE Transactions on Electron Devices, Vol. 35, No. 6 (1988)
- [**Reichl 89**] H. Reichl, Ed., Halbleitersensoren, Expert-Verlag (1989) Ehningen
- [**Roszhart 90**] T.V. Roszhart, The effect of internal friction on the Q of micromachined silicon resonators, IEEE Solid-State Sensor and Actuator Workshop, Hilton Head Island, South Carolina (1990)

- [**Sandmaier 90**] H. Sandmaier, Simulationswerkzeuge zum Design systemfähiger Mikrosensoren (SENSOR), Digest of Anwenderforum of Micro System Technologies 90, Berlin (1990) 170–175
- [**SASI**] Swanson Analysis Systems, Inc., Houston, PA, USA
- [**Satchell 89**] D.W. Satchell, J.C. Greenwood, A thermally-excited silicon accelerometer, Sensors and Actuators, Vol. 17 (1989) 241–245
- [**Sauerbrey 59**] G. Sauerbrey, Verwendung von Schwingquarzen zur Wägung dünner Schichten und zur Mikrowägung, Z. Phys. 155 (1959) 206
- [**Schwarz 84**] H.R. Schwarz, Methode der finiten Elemente, B.G. Teubner, 2. Auflage, Stuttgart (1984)
- [**Schroth 92**] A. Schroth, Modellierung mikromechanischer Membranen, Diplomarbeit, TU Chemnitz / HSG-IMIT, Villingen-Schwenningen (1992)
- [**Schorer 93**] A. Schorer, Aufbau und Erprobung eines universellen Meßplatzes für Messungen an mikromechanischen Bauelementen, Diplomarbeit, FH-Furtwangen / HSG-IMIT, Villingen-Schwenningen (1993)
- [**Schumacher 93**] A. Schumacher, Th. Fabula, H.-J. Wagner and M. Alavi, Monolithic Bridge-on-Diaphragm Transducer with Piezoelectric Excitation Fabricated by Laser Micromachining, EUROSENSORS VII, Budapest (1993)
- [**SDRC**] Structural Dynamics Research Corporation, Milford, Ohio, USA
- [**Senturia 92**] S.D. Senturia, R.M. Harris, B.P. Johnson, S. Kim, K. Nabors, A. Shulman, J.K. White, A computer-Aided Design system for microelectromechanical systems (MEMCAD), Journal of Microelectromechanical Systems, Vol. 1, No. 1 (1992) 3–13
- [**Séquin 91**] C.H. Séquin, Computer simulation of anisotropic crystal etching, Proc. TRANSDUCERS '91, Digest of technical papers, San Francisco (1991) 801–906
- [**Shephard 90**] J.N. Shepherd, Prediction of anisotropic etching in (100) silicon, MME '90, 2nd Workshop on Micromachining Micromechanics and Microsystems, Berlin (1990)
- [**Shulman 91**] M.A. Shulman, M. Ramaswamy, M.L. Heytens, S.D. Senturia, An object oriented material-property database architecture for microelectromechanical CAD, Proc. TRANSDUCERS '91, Digest of technical papers, San Francisco (1991) 486–489
- [**VIBRIT-Datenblatt 81**] VIBRIT - Piezokeramik von Siemens, Datenblatt, Stand: Januar 1981, Siemens AG, Redwitz

- [Smits 83] J.G. Smits, H.A.C. Tilmans, K. Hoen, H. Mulder, J. van Vuuren, G. Boom, Resonant diaphragm pressure measurement system with ZnO on Si excitation, *Sensors and Actuators*, 4 (1983) 565
- [Smits 91a] J.G. Smits, S.I. Dalke, T.K. Cooney, The constituent equations of piezoelectric bimorphs, *Sensors and Actuators A*, 28 (1991) 41–61
- [Smits 91b] J.G. Smits, W. Choi, The constituent equations of piezoelectric heterogenous bimorphs, *IEEE Transactions on UFFC*, Vol. 38, No. 3 (1991) 256–270
- [Smits 92a] J.G. Smits, W. Choi, Very large deflection with quadratic voltage dependence of ZnO on  $Si_3N_4$  bimorph, *IEEE Transactions on UFFC, Letters*, Vol. 39, No. 2 (1992) 302–304
- [Smits 92b] J.G. Smits, Design consideration of a piezoelectric-on-silicon microrobot, *Sensors and Actuators A*, 35 (1992) 129–135
- [Sommerfeld 49] A. Sommerfeld, *Vorlesungen über theoretische Physik, Band II, Mechanik deformierbarer Medien*, Akademische Verlagsgesellschaft, Leipzig (1949)
- [Spohr 90] R. Spohr, *Ion Tracks and Microtechnology*, Wiesbaden, Vieweg Verlag (1990)
- [Stemme 90] E. Stemme, G. Stemme, A balanced resonant pressure sensor, *Sensors and Actuators*, A21–A23 (1990) 336–341
- [Stemme 91a] G. Stemme, Resonant silicon sensors, *J. Micromech. Microeng.* 1 (1991) 113–125
- [Stemme 91b] E. Stemme, G. Stemme, A balanced dual-diaphragm resonant pressure sensor in silicon, *IEEE Transactions on electron devices*, Vol. 37, No. 3 (1990) 648–653
- [SUPREM-III] SUPREM-III, Technology Modeling Associates, Inc., Palo Alto, CA, USA
- [SUPREM-IV] SUPREM-IV, Technology Modeling Associates, Inc., Palo Alto, CA, USA
- [Tabata 89] O. Tabata, et al., Mechanical properties of thin films using load-deflection of composite rectangular membranes, *Sensors and Actuators*, Vol. 20 (1989) 135–
- [Thornton 90] K.E.B. Thornton, D. Uttamchandani, B. Culshaw, A sensitive optically excited resonator pressure sensor, *Sensors and Actuators A*, 24 (1990) 15
- [Tichy 80] J. Tichy, G. Gautschi, *Piezoelektrische Meßtechnik*, Springer-Verlag, Berlin (1980)
- [Tijhuis 87] G.J. Tijhuis, *Onderzoek naar het Druk-Frequentie verband van een resonerende membraan druksensor*, Diplomarbeit (holländisch), Universität Twente, Niederlande (1987)

- [**Tijhen 91**] Tijhen, Schiller, Polla, Properties of piezoelectric thin films, IEEE (1991) 114
- [**Tilmans 92a**] H.A.C. Tilmans, M. Elwenspoek, J.H.J. Fluitman, Micro resonant force gauges, Sensors and Actuators A, 30 (1992), 35–53
- [**Tilmans 92b**] H.A.C. Tilmans, Micro-mechanical encapsulated built-in resonant strain gauges, Dissertation, Universität Twente, Enschede, Niederlande (1992)
- [**Timoshenko 87**] S.P. Timoshenko, S. Woinowsky-Krieger, Theory of plates and shells, 2nd Edition, McGraw-Hill Book Co., New York, (1987)
- [**Trimmer 89**] W.S.N. Trimmer, Microrobots and micromechanical systems, Sensors and Actuators, 19 (1989) 267–287
- [**Tolksdorf 92**] T. Tolksdorf, Statische Berechnung eines mikromechanischen Drucksensors mit der Methode der finiten Elemente, Diplomarbeit, Universität Stuttgart (1992)
- [**UBM91**] Bedienungsanleitung: Optisches Meßsystem Microfocus, UBM-Meßtechnik GmbH Ettlingen (1991)
- [**Uttamachandi 87**] D. Uttamachandi, K.E.B. Thornton, J. Nixon, B. Culshaw, Optically excited resonant diaphragm pressure sensor, Electronics Letters, Vol. 23, No. 4, (1987) 152–153
- [**Vellekoop 91**] M.J. Vellekoop, A.J. van Rhijn, G.W. Lubking, A. Venema, All-silicon plate wave oscillator system for sensors, Sensors and Actuators A, 25–27 (1991) 699–703
- [**VIBRIT-Piezokeramiken**] VIBRIT - Piezoceramics from Siemens, Ord.-No.: N-281/5035-101
- [**Vinci 91**] R.P. Vinci, J.C. Bravman, Mechanical testing of thin films, Proc. TRANSDUCERS '91, Digest of technical papers, San Francisco (1991) 943–948
- [**Wachutka 90**] G. K. Wachutka, Rigorous thermodynamic treatment of heat generation and conduction in semiconductor device modeling, IEEE Trans. on Computer-Aided-Design, Vol. 9, No. 11 (1990) 1141–1149
- [**Wachutka 91**] G. Wachutka, Unified framework for thermal, electrical, magnetic, and optical semiconductor device modeling, NASECODE VII Transactions, COMPEL, Vol. 10, No. 4 (1991) 311–321
- [**Wachutka 92**] G. Wachutka, Tailored modeling of miniaturized electrothermomechanical systems using thermodynamic methods, in: Micromechanical Sensors, Actuators, and Systems, Eds.: D. Cho, J.P. Petersen, A.P. Pisano, C. Friedrich, DSC-40, ASME, New York (1992) 183–198

- [**Wachutka 93a**] G. Wachutka, Problem-oriented modeling of microtransducers: state of the art and future challenges, EUROSENSORS VII, Budapest (1993)
- [**Wachutka 93b**] G. Wachutka, Reliability and judicious interpretation of numerical simulations, in UETP-MEMS Course: CAD Tools for MEMS, FSRM-Neuchatel, Schweiz (1993)
- [**Wagner 94**] H.-J. Wagner, Herstellung von piezoelektrisch angeregten, mikromechanischen Resonatorstrukturen und deren Charakterisierung und Evaluierung in der Anwendung als Kraftsensoren, Dissertation, TU Braunschweig / HSG-IMIT (1994)
- [**Wandt 93**] M.A.E. Wandt, persönliche Mitteilungen (1993)
- [**Weaver 90**] W. Weaver, S.P. Timoshenko, D.H. Young, Vibration problems in engineering, 5th edition, John Wiley and Sons (1990)
- [**Wenzel 88**] S.W. Wenzel, R.M. White, A multisensor employing an ultrasonic Lamb-wave oscillator, IEEE Trans. on Electronic Devices 35 (1988) 735–743
- [**White 70**] R.M. White, Surface elastic waves, Proceedings of the IEEE, Vol. 58, No. 8, (1979) 1238–1276
- [**White 87**] R.M. White, P.J. Wicher, S.W. Wenzel, E.T. Zellers, Plate-mode ultrasonic oscillator sensors, IEEE Trans. on UFFC, Vol. 34, No. 2 (1987) 162–171
- [**Wiedemann 93**] M.-C. Wiedemann, Entwicklung eines intelligenten Sensorsystems unter Nutzung eines elektrothermisch angeregten mikromechanischen Resonators, Diplomarbeit, FH-Kiel (1993)
- [**Wolfram 91**] S. Wolfram, MATHEMATICA - A system for doing mathematics by computers, 2nd Edition, Addison-Wesley Publishing Company, Inc., Redwood City (1991)
- [**Young 50**] D. Young, Vibration of rectangular plates by the Ritz method, Journal of applied Mechanics, Dec., (1950) 448–453
- [**Young 89**] W.C. Young, Roark's formulas for stress and strain, 6th Edition, McGraw-Hill Book Co., New York, (1989)
- [**Zelenka 86**] J. Zelenka, Piezoelectric resonators and their applications, Elsevier, Amsterdam (1986)
- [**Zienkiewicz 84**] O.C. Zienkiewicz, Methode der finiten Elemente, 2. Auflage, Carl Hanser Verlag, München-Wien (1984)
- [**Zienkiewicz 87**] O.C. Zienkiewicz, J.Z. Zhu, A simple error estimator and adaptive procedure for practical engineering analysis, Int. Journal for Numerical Methods in Engineering, Vol. 24 (1987) 337–357