



Piezo Film Sensors

Technical Manual

Internet Version

Part 17 of 18

Index of Piezo Film Articles

INDEX OF PIEZO FILM ARTICLES

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CODE	AUTHOR AND REFERENCE	TITLE
DEFOULING		
DF1	U.S Patent, 4,170,185 P.V. Murphy, M.J. Latour, Lectret S.A. (Switzerland) Oct. 9 1979.	Preventing Marine Fouling.
DF2	US DOD, Small Bus. Innovation Research Program; Ocean Power Technologies, Inc. Topic #DARPA 90-111	Piezoelectric Copolymer Antifouling System
ACTUATORS (Electromotional Devices)		
EM1	M. Toda & S. Osaka (RCA, Japan.) Proceedings of the IEEE.67(8). August, 1979.	Vibrational Fan Using the Piezoelectric Polymer PVF2.
EM2	M. Toda & S. Osaka (RCA Japan). Transactions of the IECE of Japan. 61(7). July 1978.	Electromotional Devices Using PVF2 Multilayer Bimorph.
EM3	M. Toda (RCA, Japan) Transactions of the IECE of Japan 61(7). July, 1978.	Design of Piezoelectric Polymer Motional Devices with Various Structures.
EM4	Gale E. Nevil, Jr. & Alan F. Davis. Paper from "Robotics Research: The next Five Years and Beyond". Aug. 14-16, 1984.	The Potential of Corrugated PVDF Bimorphs for Actuation and Sensing.
EM5	U.S. Patent, 4,666,198 Heiserman, David L., Microflex Technology.	Piezoelectric Polymer Microgripper.
EM6	Linville, J.G. Stanford University. ©1986 IEEE	Piezoelectric Polymer Transducer Arrays.
EM7	Clive Robertson, Pennwalt (Europe) Applications Note	Bi-Directional Piezo Actuator for Electronic Solution.
EM8	M. Toda, K. Park, Atochem Sensors	Update on Novel Piezo Film Actuators and Ultrasound Transducers.
EM20	Amr M. Baz, Jeng-Jong Ro. Sound & Vibration, March 1994	The Modal Performance of Active Constrained Layer Damping Treatments
EM21	M. Sasaki, P.K.C. Wang, F. Fujisawa	Stability Analysis of Piezo Polymer Flexible Twisting Micro-Actuator with a Linear Feedback Control.
EM22	US Patent 5,295,014, Minoru Toda	Two-Dimensional Laser Beam Scanner Using PVDF Bimorph.
EM23	Minoru Toda, Ferroelectrics, 1979, Vol.22, pp 911-918	Theory of Air Flow Generation By A Resonant Type PVF2 Bimorph Cantilever Vibrator.

FORCE TRANSDUCERS

F1	G.R. Crane (Bell Labs, Holmdel) Transactions on Sonics and Ultrasonics. SU-25(6). November, 1978.	Poly(vinylidene)Fluoride Used for Piezoelectric Coin Sensors.
F4	D.S. Leitner (Columbia U.) & M.C. Rosenberger (N.Y. Psych. Inst) Behaviour Research Methods and Instrumentation. 15(5). 1983.	A Simple and Inexpensive Startle Transducer with High Output.
F5	U.S. Patent 4,282,532 R.G. Markham (Xerox Corp.) August 4, 1981.	Ink Jet Method and Apparatus Using a Thin Film piezoelectric Excitor for Drop Generation.
F15	National Bureau of Standards NBSIR 76;1078. June 1976	Polymer Transducers for Dynamic Pressure Measurements.
F17	K.T. Park et al, IEEE 1986 International Symposium on the Applications of Ferroelectrics.	A charge Readout Algorithm for Piezo Force Transducers.
F18	Seh-leh Chou et al. From Proceedings of the 1986 SEM Spring Conference on Experimental Mechanics. New Orleans, LA. June 3-18, 1986.	Interlaminar Normal Stresses in a Multilayered Plate -Theory and Experiment.
F22	Scottish Schools Science Equip. Research Centre. January, 1987.	Electronic Balances using Kynar Piezo Film.
F27	A.A.H.P. Megans, J. et al Janssen Pharmaceutica Psychopharmacology(1987)93:	Behavioral activity of rats measured by a new method based on the piezo-electric principle.
F30	USA Patent 4,807,482. Kyung T. Park, Upper Darby; Richard D. Klafter, Wyncote, both of Pa.	Method and Apparatus for Measuring Stimuli applied to a Piezoelectric Transducer.
F32	USA Patent 4,512,431. April 23 1985.	Weight Sensing Apparatus Employing Polymeric Piezoelectric Film
F35	A. G. Bagnall, Harrow School, Harrow, Middlesex, UK	Indication Using Piezo Film
F41	A. J. Tuzzolino; Nuclear Instruments & Methods in Physics Research 00 (1991) NIM06317, North-Holland; Elsevier Science Purlibhsers B.N.	Two-dimensional position-sensing PVDF dust detectors for measurement of dust particle trajectory, velocity, and mass
F42	D. A. Dillard, G. L. Anderson, D. D. Davis; 35th Sagamore Army Matls Res. Conf., Manchester, NJ June 26-30, 1988.	A Preliminary Study of the use of Kynar Piezoelectric Film to Measure Peel Stresses in Adhesive Joints
F43	Randy Fromm, RePlay Magazine, November 1991	Goldie's System 3 Pinball
F44	W. Nitsche, M. Swoboda, P. Mirow, Berlin; Z. Flugwiss. Weltraumforsch. 15(1991) 223-226. Springer-Verlag 1991	Shock Detection by means of Piezofoils.
F45	W. N. Nitsche, P. Mirow, J. Szodrich, Berlin; Experiments in Fluids, Springer-Verlag 1991	Piezo-electric foils as a means of Sensing Unsteady Surface Forces

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F46	Pieter de Bruyne, Laboratory for Communication Technology, Zurich, Switzerland; presented at International Graphics Symposium, Tempe AZ, Oct 27-30, 1993.	A Piezo-Electric Recording Device of Writing Velocity
F47	UK Patent, 2,235,802A; John Ronald Parks, National Research Development Corporation, London, 03-13-91.	Capturing Information in Drawing or Writing
F48	A.J. Tuzzolino, J.Z. Simpson, R.B. McKibben, H.D. Voss, H. Gursky. Adv Space Res., Vol 13, no 8, pp 133-136.	An Instrument For Discrimination Between Orbital Debris and Natural Particles In Near-Earth Space.
F49	A.J. Tuzzolino. Nuclear Instruments and Methods in Physics Research 1992.	PVDF Copolymer Dust Detectors: Particle Response and Penetration Characteristics.

FLOW

FL1	Pennwalt News Release. May 1982	Piezo Film is key to Unique Flowmeter in New Perkin-Elmer Monitoring System.
FL4	Clive Robertson, Pennwalt Piezo Film Ltd. Edinburgh	The Use of Piezo Film for Sensing Fan Failure.
FL5	K. Sakai, Tokyo Gas Co, M. Okabayashi, Osaka Gas Co, Yasuda, Toho Gas Co.	Fluid Flowmeter - Gas Flowmeter Based on Fluidic Dynamic Oscillation.
FL8	Richard Brown, Pennwalt Piezo Film Ltd. Edinburgh, Scotland	Flowmeter using Multiple Transducers
FL9	E. J. Stefanides <i>Design News</i> , p. 107; 7/23/91	Piezo Sensor Upgrades Wastewater Sampler Accuracy
FL10	U.S. Patent 4,920,794 Ingman, 1988	Fluid Flow Meter
FL11	Richard Brown, Elf Atochem Sensors, Ltd., July 1992	100k Level Sensor with Digital Output
FL12	Richard Brown, AMP Sensors EMEA	Discussion of Ultrasonic Ink Level Sensing

GENERAL

G6	M. Toda (RCA Japan). J.Appl. Phys. 51(9), September 1980	Properties of Piezoelectric PVF2.
G15	Pennwalt Corporation. Material Safety Data Sheet. Nov. 15, 1986.KYNAR Piezo Film	
G19	U.S. Patent, 4,633,122 P.F. Radice (Pennwalt) Dec. 30, 1986.	Means for Electrically Connecting Electrodes on Different Surfaces of Piezoelectric Polymer Films.
G23	N.A. Suttle, Marconi Research Centre. GEC Journal of Research, Vol.5, No. 31987	New Piezoelectric Polymers
G24	Invention Record, Pennwalt Piezo Film Ltd. Edinburgh	Forming, mechanical and electrical connections to printed circuit boards.

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G27	Francois Bauer, Lucien Eyraud Sintered Ferroelectric Polymers	Polymer PVDF and P(VDF-TrFE) Copolymers.
G30	Encyclopedia of Polymer Science and Engineering, Vol. 17, p. 532	Vinylidene Fluoride Polymers
G31	U.S. Patent 4,931,019, Kyung T. Park, 1 Sep 1988.	Electrostatic Image Display Apparatus
G32	Richard A. Ferren, Atochem Sensors, Inc. 1990	Polymeric Piezoelectric Transducers
G34	Steve Garrison, The Science Teacher, Feb. 92	Piezoelectric Film. . Investigate its Flexibility
G35	U.S. Patent 5,089,741, K. Park, F. Gastgeb, G. Daniels, Atochem Sensors, Inc. 1990	Piezo Film Impact Detector with Pyro Effect Elimination
G36	W. Campbell, Jr., J. J. Scialdone, Goddard Space Flight Center, Greenbelt, MD; NASA Reference Publication 1124 Revision 2	Outgassing Data for Selecting Spacecraft Material
G37	B.A. Auld (Stanford U.) & J.J. Gagnepain. J. Appl Physics. 50(8). August 1979.	Shear Properties of Polarized PVF2 Film Studied by the Piezoelectric Resonance Method.
G38	Nicola A. Suttle	New Piezoelectric Polymers
G41	D. Clarkson, Maplin Magazine, Jan 1993, pp 36-39	Piezoelectric Technology
G42	D. M. Brown, B&D Insts & Avionics, Inc. Valley Center, KS. Sensors Expo Proc, 1991; pp 105A-1 - 105A-11	Applications of PVDF for Aircraft Sensors
G43	F. Bauer, St. Louis, FR; J. Simonne, Toulouse, FR; L. Audaire, Grenoble, FR. 8th IEEE Int'l Symp. on Applic. of Ferroelectrics, Greenville, SC, Aug 31- Sep 2, 1992	Ferroelectric Copolymer and IR Sensor Technology applied to Obstacle Detection
G44	US Patent 5,424,716. Kyung Park	Penetration Detection System
G45	Joseph Dougherty. Penn State MDR Composite Lab Report	Piezoelectric Powder Composites.
G46	Ken Turner. Schaumburg High School	Smart Sensors Module Report
G47	Glen MacGibbon. Appliance Engineer	Piezo Film Sensors For Appliance Applications.
G48	M.G. Broadhurst, G.T. Davis, J.E. McKinnon, R. Collins	Piezoelectricity in PVDF-A-Model

HYDROPHONES

H1	T.D. Sullivan & J.M. Powers (U.S. Navy). J. Acoust. Soc. Am. 63(5). May 1978.	Piezoelectric Polymer Flexural Disk Hydrophone.
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H3	B. Woodward & R.C. Chandra (EE Dept., Lonborough U of Tech.) Electrocomponent Sci & Tech. 5. 1978.	Underwater Acoustic Measurements on Polyvinylidene Fluoride Transducers.
H4	Powers (U.S. Navy). Naval Underwater Systems Center, New London, CT 06320	Piezoelectric Polymer - An Emerging Hydrophone Technology.
H6	R.H. Tancrell, D.T. Wilson, D.T. and D. Ricketts, Raytheon Research Division.	Properties of PVDF Polymer for Sonar.
H8	J.M. Powers (U.S. Navy).	Long range Hydrophones.
H10	M. A. Josserand and C. Maerfeld, Thomson-CFS, France.	$\frac{1}{2}$ Velocity Hydrophones.
H11	David R. Fox, IEEE Journal of Oceanic Engineering, Vol. 13, No. 4, Oct. 1988	A Low-Density Extended Acoustic Sensor for Low-Frequency Arrays
H13	Atochem Sensors, Inc. 12/31/90	Piezoelectric Polymer Hydrophones
H14	Innovative Transducers Inc., 1990	PISCIS MS-4 Marsh/Swamp Hydrophone PISCIS MS-5 Marsh/Swamp Hydrophone PISCIS BC-4 Bottom Cable Hydrophone
H15	Gregory Kaduchak, Christopher Kwaitkowski, Philip Marstan. J. Acoustic Soc. Am. 97 (5) Pt 1, May 1995	Measurement and Interpretation of the Impulse Response For Backscattering By A Thin Spherical Shell Using A Broad-Bandwidth Source That Is Nearly Acoustically Transparent.
H16	Clayton Spikes, Christopher Clark, Wha Sea Technology, April 1996	Whale Sea Technology Applying Marine Mammal Monitoring Technology

IMPACT SENSORS

I1	U.S. Patent 4,904,894 Henry et al. February 1990	Hail Sensor
I2	Joseph Paradiso, Craig Ablett, The Mayo Clinic, May 1994	Immersive Environments

KEYBOARDS

K2	Patent 4,234,813 Heishaburo et al. (Toray Ind) November 18, 1980.	Piezoelectric or Pyroelectric Polymer Input Element for Use as a Transducer in Keyboards.
K6	U.S. Patent 4,328,441. F.R.Kroeger & R.A. Norquist (3M) May 4, 1982.	Output Circuit for Piezo-electric Polymer Pressure.
K9	J.V.Chatigny, Atochem Sensors	Novel Switch Ideas Using Piezo pyroelectric Polymer films.

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K10	U.S. Patent, 4,633,123. P.F. Radice (Pennwalt) Dec. 30, 1986	Piezoelectric Polymer Keyboard Apparatus.
K11	U.S. Patent, 4,975,616. K.T. Park	Piezoelectric Transducer Array.
K12	U.S. Patent, 5,315,204. Kyung Park	Piezoelectric Snap Action Switch.

MICROPHONES

M1	H.Naono, T.Gotch, M. Matsumoto (Acoustic Research Lab, Japan).	Design of an Electro-Acoustic Transducer using Piezoelectric Polymer Film.
M2	G.M. Garner (Allen Clark Research Centre). Systems Technology. 27 November 1977.	A new Microphone for Telephone Handsets.
M3	Pioneer Electric Corp.	Electroacoustic Transducer with Piezoelectric High Polymer Films.
M5	J.F. Sear & R. Carpenter (Allen Clerk - UK). Electronic Letters. 11. 1975.	Noise-Cancelling Microphone using a Piezoelectric Plastic Transducing Element.
M6	Reihard Lerch (Darmstadt, FRG). J. Acoust. Soc. Am. 66(4) October, 1979	Electroacoustic Transducers using Piezoelectric Polyvinylidene fluoride Films.
M11	R. Lerch & G.M. Sessler. J. Acoust. Soc. Am. 76(4) April 1980	Microphone with Rigidly Supported Piezo Polymer membranes.
M15	I. Veit, Sennheiser Electronic Wedemark, Germany. Presented at 84th Convention of Audio Engrg Society, March 14, 1988	The Piezoelectric PVDF Film. Its properties and application in electroacoustic transducers.
M17	Edward F. Downs, Jr. NCSC IR415-89	Independent Exploratory Development Piezoelectric Diver's Microphone Development.

MEDICAL APNEA

MA2	UK Patent, 2,138,144, A J. Fraden ,Timex Medical, USA 14 February 1984.	Cardio-Respiration Transducer.
MA5	D.DeRossi and P Dario University Pisa and ICR Application Pisa	Biomedical Application of Piezoelectric and Pyro-Electric Polymers.
MA6	F. Steenkeste and &. Moschetto et al. The Application of PVF2 Fetal	Phonocardiographic Transducers.
MA7	K. Kobayashi & T. Yasuda Tokyo Ins. of Technology	The Application of PVDF Film to Medical Transducers.
MA8	D. Dario, D De Rossie, R. Bedini, R. Francesconi & M.G. Trivella, Pisa, Italy.	PVF2 Catheter-Tip Transducers for Pressure, Sound & Flow Measurements.
MA10	Sally L. Hope et.al. Park Lane Surgery, Woodstock, Oxford UK. Journal of Ambulatory Monitoring 1988, Vol. 1 no. 1, 39-51.	Validation of the Accuracy of the Medilog ABP non-invasive blood-pressure monitor.

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MA11	J. Fraden, Journal of Clinical Engineering. Vol.13, No3, Mar-April 1988.	Applications of Piezo/Pyroelectric Films in Medical Transducers.
MA14	U.S. Patent, 4,690,143, E. A. Schroepel, Miramar, FL, Jan. 24, 1986	Pacing Lead with Piezoelectric Power Generating Means
MA16	D. Cavaye, M. Tabbara, G. Kopchok, R. White. Harbor-UCLA Med Ctr. Presented at So Cal Vascular Surgical Society Annual Scientific Mtg, Marina Del Ray, CA 9/91	Continuous Piezoelectric Pulse-Sensor Monitoring of Peripheral Vascular Reconstructions.
MA17	J. French, A. Siebens, Div of Rehab Medicine, Johns Hopkins Univ. Presented at RESNA 13 Annual Conf, Washington DC 1990	Interfacing Piezoelectric/ Pyroelectric Sensors for use with Communication Devices
MA18	C. K. McKibben, N. V. Reo, Dept of Chemistry, Kettering-Scott Magnetic Resonance Lab, Wright State Univ & Kettering Medical Center, Dayton OH	A Piezoelectric Respiratory Monitor for In Vivo NMR
MA19	Medical Electronics Buying Guide. Sept 1994	Buyers Guide and Market Analysis
MA20	SBIR Research Proposal, Phase I Abstract	A Bilaminate Electronic Bioinductive Wound Seal.
MA21	Allen Zuckerwar, Robert Pretlow, John Stoughton, Donald Baker. IEEE Vol 40, No 9, September 1993	Development of a Piezopolymer Pressure Sensor for a Portable Fetal Heart Rate Monitor.
MA22	Chris Henry. July 1988	Vascucare Respiration Air Monitor (R.A.M.) Phase II, Engineering Report.
MA23	S. Chonan, Z.W.Jiang, Y. Tanahashi, M. Asaka, Y. Suga	Soft Piezoelectric Sensor & its Application to Measurement of the Stiffness of Prostate Glands
MA24		North American Science Research Associates Inc. RESEARCH REPORT ON TOXICITY

MEDICAL OSTEOGEN

MO1	J.J. Ficat, R. Durroux et al (France). Univ Paul Sabatier	Use of Piezoelectric Polymer.
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MS4	Pennwalt Press Release. June 1985.	Virtuoso Qualities in Electric Violin Made Possible by New Transducer Material.
MS5	Pennwalt Press Release. July 1985.	Piezo Film Pickup puts "The Sound of Magic" in New Gibson Guitar Line.

MEDICAL ULTRASOUND

MU5	Toray Industries, Tokyo, Japan. Ind. Publication	Piezoelectric Polymer Transducers for High Resolution Ultrasound Imaging.
MU6	J. Callerame et al. (Raytheon) in 1978 Ultrasonics Symposium, J. DeKerk & B.R. McAvoy, Editors IEEE Cat. No. 78 1344-ISU.	Comparison of Ceramic and Polymer Transducers for Medical Imaging.
MU7	N. Chubachi (Japan). Paper presented at Joint Meeting of the Acoustical Society of America and Acoustical Society of Japan (Honolulu, 1978).	Piezoelectric Polymer Transducer and its application to Acoustics.
MU10	Mark Schafer & Peter A. Lewin. IEEE Transactions on Sonics and Ultrasonics, Vol. SU-31 No 4. July 1984	The Influence of Front-End hardware on Digital Ultrasonic Imaging.
MU13	F.S. Foster et.al. Ultrasound in Med. & Biol. 9(2) 151-164, 1983	Real Time Imaging with a Conical Transducer/Annular Array Hybrid Scanner.
MU16	Peter A. Lewin & Mark Schafer. Drexel University, Philadelphia, PA.	Piezoelectric Polymer Transducers for Ultrasound Dosimetry Application.
MU17	M. Platte.	A Polyvinylidene Fluoride Needle Hydrophone for Ultrasonic Applications.
MU18	C.T. Lancee, J. Souquet, H. Ohigashi and N. Bom, Fifth Symposium on Echo-cardiology, Rotterdam, 1983.	Ferroelectric ceramics versus polymer piezoelectric materials.
MU23	D.W. Fitting et al. IEEE Transactions on Ultrasonics, Ferroelectrics, vol. UFFC-34 No. 3, May 1987.	A Two-Dimensional Array Receiver for Reducing Refraction Artifacts in Ultrasonic Computed Tomography of Attenuation.
MU24	M. D. Shearer, F. S. Foster, University of Toronto.	40-100 MHz PVDF Ultrasound Microscope with Biological Applications.
MU25	Valerie P. Jackson, M.D. et al. RADIOLOGY, Vol. 159, No. 3, Pages 679-684, June 1986.	Automated Breast Sonography Using a 7.5MHz PVDF Transducer: Preliminary Clinical Evaluation.
MU26	L. F. Brown & D. L. Carlson. IEEE Trans. on Ultrasonics, Ferroelectrics & Freq Control. Vol.36, No3, May 1989.	Ultrasound Transducer Models for Piezoelectric Polymer Films.
MU28	Stephen W. Smith, Principle Investigator, ERDC	Ultrasound Transducers
MU30	B. Granz, R. Holzapfel, G. Kohler, IEEE 1989 Ultrasonics Symposium	Measurement of Shock Waves in the Focus of a Lithotripter
MU31	P. A Contla, D. K. Das-Gupta, IEEE 1991	Ultrasonic Piezoelectric Transducer for Biomedical Applications
MU32	R. Goldberg, S. Smith, Dept. Biomedical Engrg, Duke Univ., Durham, NC; L. Brown, Atochem Sensors, Inc., Valley Forge, PA	In Vivo Imaging using a Copolymer Phased Array

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MU33	L. F. Brown, PhD., Elect Engrg Dept, So Dakota St Univ; Presented at 1992 SPIE International Symposium on Optical Applied Science and Engineering, 7/21/92, San Diego, CA	New Developments in Piezoelectric Polymer Ultrasound Transducers and Transducer Systems
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NON-DESTRUCTIVE TESTING

NDT1	R.Stiffler & E.G. Henneke, 11 (VPI). Materials Evaluation, 41. July, 1983.	Application of Polyvinylidene Fluoride as an Acoustic Emission Transducer for Fibrous Composite Materials.
NDT4	Systems & Instrumentation Ltd Plymouth, Devon, England.	
NDT8	Lewis F. Brown, Ph.D. Pennwalt Corp., Valley Forge, PA. Presented at ASNT 1989 Fall Conference Oct 9-13 1989.	Piezoelectric Polymer Ultrasound Transducers for Nondestructive Testing.
NDT9	Lewis F. Brown, Ph.D. Pennwalt Corp., Valley Forge, PA. Presented at 7th Intl Symposium on Applic. of Ferroelectrics, June 6-8, 1990	New Ferroelectric Polymer Ultrasound Contact Transducers for Non-destructive Testing Applications
NDT10	Lewis F. Brown, Ph.D. Pennwalt Corp., Valley Forge, PA. Presented at 1990 Review of Progress in Quantitative NDE, July 15-20, 1990	Permanently Mounted Piezo Film Sensors for Structural Quantitative NDE
NDT11	Lewis F. Brown, PhD. Atochem Sensors, Inc. Valley Forge, PA. Presented at 1991 Review of Progress in Quantitative NDE, July 28-Aug. 2, 1991	PFS-Gap: A Large Area Ultrasonic Gap Profile Measurement System
NDT12	J. Bulteel, Sensor Review, Vol. 11 No. 3. 1991. pp. 23-24	Polymer Materials for Ultrasonic Transducers
NDT13	L.F. Brown, PhD. So Dakota St Univ, Brookings, SD; W.M. Sisson, United Technologies Res. Ctr, East Hartford, CT; C.P. Guerin, Elf Atochem Sensors, Valley Forge, PA. Presented at 1992 Conf on Review of Progress in Quantitative Nondestructive Evaluation, July 23, 1992, Univ of Cal-San Diego	Custom PVDF Transducers for Pulse-Echo Testing of Solid Rocket Motors for Detection of Propellant-to-Boot-Liner Unbonds
NDT14	L.F. Brown, PhD. So Dakota St Univ, Brookings, SD. Presented at 1992 IEEE Fall Ultrasonics Symposium, Oct 20-23, 1992, Tucson, AZ	Ferroelectric Polymers: Current and Future Ultrasound Applications
NDT16	Lewis Brown. 1992 IEEE 8th International Symposium on Acoustics and Ultrasonics	Extremely Broadband Ferroelectric Polymer Ultrasound Transducers

OPTICAL

OP1	T. Sato, H. Ishida & Co. Ikeda (Japan). Applied Optics 19(9) April, 1980.	Adaptive PVDF Piezoelectric Deformable Mirror System.
OP2	H. Ohigashi, R. Shigenari, & M. Tokota (Toray, Japan) Japan J. Appl. Phys. 14(7) 1975.	Light Modulation by Ultrasonic Waves from Piezoelectric Polyvinylidene Fluoride Films.
OP3	D. Broussoux & F. Micheron (France). J. Appl. Phys. 51(4). April, 1980.	Electro-optic and Elastoptic Effects in Polyvinylidene Fluoride.

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OP5	S.A. Kokorowski (Hughes Research). J Opt. Soc. Am. 69(1) January, 1979.	Analysis of Adaptive Optical Elements Made from Piezoelectric Bimorphs.
OP6	R. Kashyap & P. Pantelis. Second Symposium on Optic Fibre Measurements, Oct. 13-14 1982	Measurement of Optical Fibre Absorption Loss: A Novel Technique.
OP7	P. D. DeSouza, M. D. Mermelstein, Applied Optics, Dec. 1982	Electric Field Induced Birefringence in a Piezoelectric Polymer-jacketed Single-Mode Optical Fiber
OP8	H. Coufal (IBM) Applied Physics Letters. 44(1) January 1984	Photothermal Spectroscopy Using a Pyroelectric Thin-Film Detector.
OP9	U.S. Patent 4,748,366 George Taylor, Sept. 2, 1986	Novel uses of Piezoelectric Materials for Creating Optical Effects
OP10	H. Sasabe, T. Nakayama et al. (Japan). Polymer Journal 13(10). 1981.	Photovoltaic Effect in Poly(vinylidene fluoride)
OP11	A. Mandelis (Toronto) Chemical Physics Letters 108(4). July 13, 1984.	Frequency-Domain Photopyroelectric Spectroscopy of Condensed Phases (PPES): A New Simple and Powerful Spectroscopic Technique.
OP12	V. S. Sudarshanam, R. O. Claus, Fiber & Electro Optics Res Ctr, VA Polytechnic Inst & State Univ, Blacksburg, VA. Accepted for publication in Proc Optical Fiber Sensors '93) Firenze, Italy, May 1993.	Fiber Optic Polarization and Phase Modulator Utilizing a Transparent Piezofilm with Indium Tin Oxide Electrodes

PYROELECTRIC

P5	K. Shigiyama & K. Miura (Matsushita Comm. Inds. Co.,Japan). Presentation.	PVDF Infrared Detector and Microphone for Monitoring.
P7	U. Korn, Z. Rav-Noy & S. Shtrikman (Israel). Applied Optics 20(11). June 1981.	Pyroelectric PVF2 Infrared Detector Arrays.
P12	U.S. Patent 3,824,098 J.G. BERGMAN et al. (Bell Labs) July 16, 1974.	Pyroelectric Copying Device.
P17	L.E. Ravich. Electronic Imaging. June 1984.	Pyroelectric Infrared Detectors.
P19	Pennwalt Corporation	KYNAR Properties.
P24	H. Meixner, G. Mader, P. Kleinschmidt. Siemens Entwickl. - Ber.Bd.15(1986)Nr.3.	Infrared sensors based on the Pyroelectric Polymer Poly-Vinylidene Fluoride (PVDF).
P25	Microwatt Applications. Sea Cliff, New York, U.S.A.	Comparison of Pyroelectric and Piezoelectric Properties and Manufacturing of Several Detector Materials for Military and Scientific Applications.

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P26	Microwatt Applications. Sea Cliff, New York. Detection Systems with Pyroelectric IR Detectors.
P27	Alan P Doctor, Microwatt Applications Inc., Martin Rost, Servo Corporation. Pyroelectrics for Smart Munitions.
P29	M. Hammerich and A. Olafsson. Physikalisch-Technische Bundesanstalt. Laser Power Monitor for the 1mW to 50W range.
P30	Reinhard Freitag, Hans Meixner Siemens AG, Corporate Research and Development, Munich, West Germany. PVDF Sensor Array for Human Body Detection.
P33	U.S. Patent 4,797,840 Jacob Fraden, Hamden, Conn. Jan 10, 1989. Infrared Electronic Thermometer and Method for Measuring Temperature
P34	Richard Brown, ASL; 14 Dec 1990. Thermal Detector
P36	M. Thompson, Atochem Sensors, Valley Forge, PA. Presented at the 1991 Sensors Conference, Chicago, IL. Advances in Passive Infrared Sensors Based on Pyroelectric Polymer Films
P37	Edward Tom, Atochem Sensors, Valley Forge, PA. Polymer Passive Infrared Design for Long Range Detection
P38	Edward Tom. SENSORS Sept 1994. Polymer Film Arrays in Pyroelectric Applications

POWER GENERATION

PW2	Hausler, E. & Stein L. Paper presented at Oceanic Mechanical-Electric Power Converter.
PW3	Richard Brown, Pennwalt (Europe). Applied ED Report.
PW9	Richard Brown, ASL; 1 Jan 1991. Piezo Film Power Supply; Tyre Sensor
PW10	Richard Brown, ASL; 3 Mar 1991. Energy Generation Using Piezo Film
PW11	G.E. Taylor, J. R. Burns, OPT. Hydropiezoelectricity
PW12	Otter Controls Ltd, Derbyshire, England; OTT2000. Signal an End to High-Speed Tyre Blow-outs
PW13	USA Patent 3,665,226. R. Sinker, G. Williams; (Hughes Aircraft) May 23, 1972. Electric Power Source
PW14	V. Hugo Schmidt. 1992 Ultrasonics Symposium. Piezoelectric Energy Conversion in Windmills.
PW15	V. Hugo Schmidt. IEEE, 1986. Theoretical Electrical Power Output Per Unit Volume of PVF2 and Mechanical-To-Electrical Conversion Efficiency as Functions of Frequency.

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R4	P. Dario, C. Domenici, R. Bardelli et al. Published Paper New Sensor Materials for Robotic Applications.	
R5	P. Dario, R. Bardelli, D. de Rossie et al. Sensor Review. October, 1982.	Touch-sensitive Polymer Skin Uses Piezoelectric properties to Recognize Orientation of Objects.
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