Eun Sok Kim

Ming Hsieh Dept. of Elec. and Comp. Engr.
University of Southern California
Los Angeles, CA 90089-0271
(213) 740 – 4697
email: eskim@usc.edu
http://mems.usc.edu

Education: University of California, Berkeley, California
Ph.D. EECS, Solid State Devices (Integrated Sensors), 11/90

University of California, Berkeley, California
M.S. EECS, Solid State Devices (IC-Processed Piezoelectric Microphone), 5/87

University of California, Berkeley, California
B.S. EECS with High Honors, Electronics Specialization, 6/82

Experience:

9/99-Present Ming Hsieh Department of Electrical and Computer Engineering, Univ. of Southern California, Los Angeles, CA
Professor: Research interests include microelectromechanical systems (MEMS) technology, acoustic and piezoelectric MEMS, electromagnetic vibration-energy harvesting, inertial sensing, resonant mass sensing, and their applications to biomedicine and information technology. Typically teaches a graduate-level course on MEMS and a senior-undergraduate-level course on analog integrated circuits.
Department Co-Chair (from 7/09 to 6/18): Chaired the Electrophysics division of the department, and oversaw a net tenure-track-faculty growth of 2.5 (from 15.25 to 17.75), 6.5 new tenure-track-faculty hires, a net non-tenure-track-faculty growth of 4 (from 4 to 8), a net Budget-Analysts growth of 2 (from 3 to 5), and lab space growth of 4,206 sq. ft. (from 26,833 to 31,039 sq. ft.). Additionally, made 4 new tenure-track-faculty offers and got 3 acceptances in the last year as the chair. During his tenure as the chair, US News' ranking raw score on USC EE's Graduate Program rose from 3.9 to 4.2 (out of 5.0). Faculty's anonymous evaluations on his overall chair performance in 2015 and 2018 were 4.58 and 4.60 (out of 5.00), respectively.

1/91-1/01 Electrical Engineering Department, University of Hawaii, Honolulu, Hawaii
Associate Professor (from 7/95): Taught Advanced Solid State Devices I and II (EE621 & EE625), Microsensors/Microactuators I and II (EE624 & EE626), Linear Electronics (EE326), Device Physics for IC (EE324), Field and Waves I (EE371), and Microfabrication Processing Technology (EE328). Proposed and developed two new graduate courses on microsensors and microactuators. Developed and established a well-funded research program on acoustic and piezoelectric MEMS.

8/84-12/90 University of California, Berkeley, California
Research Assistant: Developed and fabricated a miniature microphone using IC processes, which was reported in various news media including The Wall Street

Journal and Business Week in 1987. Designed, laid out, fabricated, and demonstrated integrated microphones with CMOS amplifiers on a single chip for the first time.

Summer 1984 — Xicor, Inc., Milpitas, California
CMOS Device Engineer: Characterized newly developed CMOS devices.

8/83-5/84 — University of California, Berkeley, California
Teaching Assistant: Taught discussion sessions for Integrated-Circuit Devices course and laboratory sessions for Digital Integrated Circuits course.

7/82-8/83 — NCR Corp., San Diego, California
Associate Engineer-Design: Designed a control, monitor and maintenance panel for a fault-tolerant power system of a mainframe computer.

7/81-12/81 — IBM Research Lab., San Jose, California
College Student Engineer: Characterized experimental magnetic bubble memory chips and documented the measurement results.

Honors and Awards:

Fellow of IEEE, 2011

Fellow of the Institute of Physics (IOP), 1996

IEEE Transactions on Automation Science and Engineering 2006 Best New Application Paper Award on "In-situ DNA Synthesis on Glass Substrate for Microarray Fabrication Using Self-Focusing Acoustic Transducer," by J.W. Kwon, S. Kamal-Bahl and E.S. Kim, April 2006, pp. 152-158.

Outstanding EE Faculty of the Year Award (voted by UH IEEE student chapter), 1996

Faculty Early Career Development (CAREER) Award from National Science Foundation (NSF), 1995

Research Initiation Award from National Science Foundation, 1991

Research & Training Revolving Fund Award from UH, 1991

University of California, Berkeley, California
B.S. EECS with High Honors, Electronics Specialization, 6/82

Member of Tau Beta Pi (Engineering Honor Society) and Eta Kappa Nu (Electrical Engineering Honor Society)

Editorial and Review:

Editor for IEEE/ASME Journal of Microelectromechanical Systems (from 2011)

Editor for Journal of Semiconductor Technology and Science (from 2000)

Editorial Board for Journal of Micromechanics and Microengineering (1995 - 2016)

Associate Editor for IEEE Transactions on Automation Science and Engineering (2006 – 2011)

Editorial Board for Micro and Nano Systems Letters (from 2013)

Reviewer of National Institute of Health, National Science Foundation, IEEE/ASME Journal of Microelectromechanical Systems, Sensors and Actuators, Applied Physics Letters, IEEE Transactions on Electron Devices, Applied Surface Science, Journal of Materials Research, and IEEE Trans. on Circuits and Systems II.

Guest Editor for Special Issue on Automation for the Life Sciences in IEEE Transactions on Automation Science and Engineering

Issued Patents:

[IP16] *Energy Harvester with Magnets and Self-assembled Ferrofluid Liquid Bearing*, E.S. Kim and Y. Wang, U.S. Patent Number 10,418,890

[IP15] *Acoustic Tweezers*, E.S. Kim, Y. Choe, J.W. Kim and K.K. Shung, U.S. Patent Number 10,106,397

[IP14] *Electromagnetic Energy Conversion through Coil and Magnet Arrays*, E.S. Kim and Q. Zhang, U.S. Patent Number 9.231.461.

[IP13] *Self Focusing Acoustic Transducers with Fresnel Reflector/Absorber Lens,* E.S. Kim, H. Yu and C. Lee, U.S. Patent Number 7,719,170.

[IP12] *MEMS Vascular Sensor,* T. K. Hsiai, G. Soundararajan, E. S. Kim, H. Yu, M. Rouhanizadeh, and T. Lin, U.S. Patent Number 8,216,434.

[IP11] *MEMS Vascular Sensor,* T. K. Hsiai, G. Soundararajan, E. S. Kim, H. Yu, M. Rouhanizadeh, and T. Lin, U.S. Patent Number 7,367,237.

[IP10] *Silicon Inertial Sensors Formed Using MEMS*, E.S. Kim and Q. Zou, U.S. Patent Number 7,481,112 B2.

[IP9] *Silicon Inertial Sensors Formed Using MEMS*, A. Madni, Q. Zou, E.S. Kim, L. Costlow, J. Voung, and R. Wells, U.S. Patent Number 7,360,422.

[IP8] *DNA Probe Synthesis on Chip on Demand by MEMS Ejector Array*, E.S. Kim and J.W. Kwon, U.S. Patent Number 7,332,127.

[IP7] *Method for Fabricating a Micromachined Piezoelectric Microspeaker*, S.H. Yi and E.S. Kim, U.S. Patent 7,089,638.

[IP6] *Micromachined Piezoelectric Microspeaker and Fabrication Method Thereof*, S.H. Yi and E.S. Kim, U.S. Patent Number 7,003,125.

[IP5] *Method of Forming Parylene-diaphragm Piezoelectric Acoustic Transducers*, C.H. Han and E.S. Kim, U.S. Patent Number 6,857,501.

[IP4] *Acoustic Wave Micromixer Using Fresnel Annular Sector Actuators*, V. Vivek, E.S. Kim and Y. Zeng, U.S. Patent Number 6,682,214.

[IP3] *Self-limiting Isotropic Wet Etching Process*, E.S. Kim and C.H. Han, U.S. Patent Number 6,379,573.

[IP2] *IC Processed Piezoelectric Microphone*, R.S. Muller and E.S. Kim, U.S. Patent Number 4,816,125.

[IP1] *IC Processed Piezoelectric Microphone*, R.S. Muller and E.S. Kim, U.S. Patent Number 4,783,821.

Pending Patents:

[PP7] *Pick and Placement of Semiconductor Chips Based on Nozzleless Self-Focusing Acoustic Droplet Ejector*, E.S. Kim and Y. Tang, U.S. Patent Pending.

[PP6] *Contactless, Damage-Free, High-Precision Cell Extraction and Transfer through Acoustic Droplet Ejection*, E.S. Kim and Y. Tang, J.F. Zhong and X. Chen, U.S. Patent Pending.

[PP5] *Ultrasound Transducer with Electrically Controllable Focal-Point Location*, E.S. Kim and L. Zhao, U.S. Patent Pending.

[PP4] *Ultrasound Transducer with Electrically Controllable Focal Length*, E.S. Kim and L. Zhao, U.S. Patent Pending.

[PP3] *Electrical Tuning of Focal Size with Single-Element Planar Focused Ultrasonic Transducer*, E.S. Kim and Y. Tang, U.S. Patent Pending.

[PP2] *Wearable Respiratory Monitoring System Based on Resonant Microphone Array*, E.S. Kim and A. Shkel, U.S. Patent Pending.

[PP1] *Ferrofluid Liquid Spring for Vibration Energy Harvesting*, E.S. Kim and Y. Wang, U.S. Patent Pending.

Publications:

Textbook

"Fundamentals of Microelectromechanical Systems (MEMS)," E.S. Kim, Published April 2021 by McGraw Hill, Edition: 1, ISBN: 9781264257584, Format: Print, Pages: 416.

"Look inside" with the table of contents, preface, introduction, substantial part of Ch. 1, last five pages of Ch. 10, and index is available through the following site.
https://www.amazon.com/Fundamentals-Microelectromechanical-Systems-MEMS-Eun/dp/1264257589

Errata and instructor resources are available through the following site.
https://www.mhprofessional.com/fundamentals-of-microelectromechanical-systems-mems-9781264257584-usa-group

Book Chapter

"Patch Clamp Technology for Focused Ultrasonic (FUS) Neuromodulation," E.S. Kim and S.Y. Chang, 3rd Ed. Biosensors and Biodetection, to be published in 2022, A. Rasooly, and B, Prickril (Eds.).

Refereed Journal Papers

94

[J94] Y. Tang and E.S. Kim, "*Simple Sacrificial-Layer-Free Microfabrication Processes for Air-Cavity Fresnel Acoustic Lenses (ACFALS) With Improved Focusing Performance*," Microsystems & Nanoengineering, Volume 8, Article number: 75 (2022). https://doi.org/10.1038/s41378-022-00407-w

[J93] M. Barekatain, H. Liu, and E.S. Kim, "*Wireless and Battery-less Tamper Detection with Pyroelectric Energy Converter and High-overtone Bulk Acoustic Resonator*," IEEE Sensors Journal, 2022, doi: 10.1109/JSEN.2022.3182940.

[J92] Y. Tang, L.-Y. Chen, A. Zhang, C.-P. Liao, M.E. Gross, and E.S. Kim, "*In Vivo Non-Thermal, Selective Cancer Treatment with High-Frequency Medium-Intensity Focused Ultrasound*," IEEE Access, vol. 9, pp. 122051-122066, 2021.

[J91] Y. Tang and E.S. Kim, "*Nozzleless Acoustic Droplet Ejector with Electrically Tunable Droplet Size for Picking and Placing Semiconductor Chips*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 30, no. 2, pp. 262-270, 2021.

[J90] H. Liu, S. Liu, A.A. Shkel and E.S. Kim, "*Active Noise Cancellation with MEMS Resonant Microphone Array*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 29, no. 5, pp. 839-845, 2020.

[J89] Y. Tang and E.S. Kim, "*Ring-Focusing Fresnel Acoustic Lens for Long Depth-of-Focus Focused Ultrasound and Multiple Trapping Acoustic Beams*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 29, no. 5, pp. 692-698, 2020.

[J88] L. Zhao and E.S. Kim, "*Analytical Dual-Charged-Surfaces Model for Permanent Magnet and Its Application in Magnetic Spring*," IEEE Transactions on Magnetics, vol. 56, no. 9, pp. 1 – 7, 2020.

[J87] A. Shkel and E.S. Kim, "*Continuous Health Monitoring with Resonant-Microphone-Array-Based Wearable Stethoscope*," IEEE Sensors Journal, vol. 19, no. 12, pp. 4629-4638, 2019.

[J86] L. Wang, A. Lin and E.S. Kim, "*Miniature Sensing System with FBAR-based Oscillators and Frequency Shift*," IEEE Sensors Journal, vol. 18, no. 18, pp. 7633 – 7637, 2018.

[J85] Y. Wang, Q. Zhang, L. Zhao and E.S. Kim, "*Non-Resonant, Electromagnetic Broad-Band Vibration-Energy Harvester Based on Self-Assembled Ferrofluid Liquid Bearing*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 26, no. 4, pp. 809 – 819, 2017.

[J84] Y. Wang, Q. Zhang, L. Zhao, Y. Tang, A. Shkel and E.S. Kim, "*Vibration Energy Harvester with Low Resonant Frequency Based on Flexible Coil and Liquid Spring*," Applied Physics Letter, 109, 203901 (2016); doi: 10.1063/1.4967498.

[J83] S. Cong, Y. Cao, X. Fang, Y. Wang, Q. Liu, H. Gui, C. Shen, X. Cao, E.S. Kim, and C. Zhou, "*Carbon Nanotube Macroelectronics for Active Matrix Polymer-Dispersed Liquid Crystal Displays*," ACS Nano, 10 (11), pp. 10068–10074, 2016.

[J82] Q. Zhang, Y. Wang, L. Zhao and E.S. Kim, "*Integration of Microfabricated Low Resistance and Thousand-turn Coils for Vibration Energy Harvesting*," Journal of Micromechanics and Microengineering, vol. 26, no. 2, 025019 (10pp), 2016.

[J81] Q. Zhang and E.S. Kim, "*Microfabricated Electromagnetic Energy Harvesters with Magnet and Coil Arrays Suspended by Silicon Springs*," IEEE Sensors Journal, vol. 16, no. 3, pp. 634 - 641, 2016.

[J80] D.A. Thomas, L. Wang, B. Goh, E.S. Kim, J. L. Beauchamp, "*Mass Spectrometric Sampling of a Liquid Surface by Nanoliter Droplet Generation from Bursting Bubbles and Focused Acoustic Pulses: Application to Studies of Interfacial Chemistry*," Analytical Chemistry, vol. 87, no. 6, pp 3336–3344, 2015.

[J79] Q. Zhang, Y. Wang and E.S. Kim, "*Electromagnetic Energy Harvester with Flexible Coils and Magnetic Spring for 1 – 10 Hz Resonance*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 24, no. 4, pp. 1193 - 1206, 2015.

[J78] Q. Zhang and E.S. Kim, "*Micromachined Energy-Harvester Stack with Enhanced Electromagnetic Induction through Vertical Integration of Magnets*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 24, no. 2, pp. 384 - 394, 2015.

[J77] Q. Zhang and E.S. Kim, "*Vibration Energy Harvesting Based on Magnet and Coil Arrays for Watt-Level Handheld Power Source*," Proceedings of the IEEE, vol. 102, no. 11, pp. 1747 – 1761, 2014.

[J76] Q. Zhang, Y. Wang, and E.S. Kim, "*Power Generation from Human Body Motion through Magnet and Coil Arrays With Magnetic Spring*," Journal of Applied Physics, vol. 115064908 (5pp), 2014.

[J75] Y. Choe, S.-J. Chen and E.S. Kim, "*Peptide Synthesis on Glass Substrate Using Acoustic Droplet Ejector*," IEEE Transactions on Biomedical Engineering, vol. 61, no. 3, pp. 705-710, March 2014. Selected to be one of the journal's three featured articles in March 2014

[J74] Y. Choe and E.S. Kim, "*Valveless Micropump Driven by Acoustic Streaming*," Journal of Micromechanics and Microengineering, vol. 23, 045005 (8pp), 2013.

[J73] L. Wang, Y.-J. Li, A. Lin, Y. Choe, M.E. Gross, and E.S. Kim, "*A Self Focusing Acoustic Transducer that Exploits Cytoskeletal Differences for Selective Cytolysis of Cancer Cells*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 22, no. 3, pp. 542-552, 2013.

[J72] K.H. Lam, H.-S. Hsu, Y.Li, C. Lee, A. Lin, Q. Zhou, E.S. Kim, K.K. Shung, "*Ultrahigh Frequency Lensless Ultrasonic Transducers for Acoustic Tweezers Application*," Biotechnology and Bioengineering, vol. 110, no. 3, pp. 881-886, 2013.

[J71] L. Baumgartel, A. Vafanejad, S.-J. Chen, and E.S. Kim, "*Resonance Enhanced Piezoelectric Microphone Array for Broadband or Pre-filtered Acoustic Sensing*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 22, pp. 107-114, 2013.

[J70] S.C. Ur, E.S. Kim, and S.H. Yi, "*The Effects of Residual Stresses in the Composite Diaphragm on the Performance of Piezoelectric Microspeakers*," Electronic Materials Letters, vol. 9, no. 1, pp. 119-123, 2013.

[J69] F. Yu, J. Lee, N. Jen, X. Li, Q. Zhang, R.Tang, Q.Zhou, E.S. Kim, T.K.Hsiai, "*Elevated Electrochemical Impedance in the Endoluminal Regions with High Shear Stress: Implication for Assessing Lipid-rich Atherosclerotic Lesions*," Biosensors and Bioelectronics, vol. 43, pp. 237-244, 2013

[J68] S.-J. Chen, Y. Choe, L. Baumgartel, A. Lin, and E.S. Kim, "*Edge-released, Piezoelectric MEMS Acoustic Transducers in Array Configuration*," Journal of Micromechanics and Microengineering, vol. 22, 025005 (2012).

[J67] W. Pang, H. Zhao, E.S. Kim, H. Zhang, and H. Yu, "*Piezoelectric Microelectromechanical Resonant Sensors for Chemical and Biological Detection*," Lab on a Chip, vol. 12, pp. 29-44, 2012.

[J66] Y. Choe, J.W. Kim, K.K. Shung, and E.S. Kim, "*Microparticle Trapping in An Ultrasonic Bessel Beam*," Applied Physics Letter, vol. 99, 233704 (2011).

[J65] Z. Wang, X. Qiu, J. Zhu, J. Oiler, S.-J. Chen, J. Shi, E.S. Kim, and H. Yu, "*Directional Acoustic Underwater Thruster*," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency, vol. 58, no. 6, pp. 1114-1117, 2011.

[J64] S.-J. Chen, C.Y. Lee, and E.S. Kim, "*Integration of Piezoelectric Tunable Capacitors and Bonded-wire Inductors for Contactless RF Switch and Tunable Filter*," Sensors and Actuators A: Physical, vol. 165, no. 1, pp. 73-78, 2011.

[J63] F. Yu, R. Li, L. Ai, C. Edington, H. Yu, M. Barr, E.S. Kim, and T.K. Hsiai, "Electrochemical Impedance Spectroscopy to Study Vascular Oxidative Stress," Annals of Biomedical Engineering, vol. 39, no. 1, pp. 287-296, 2011.

[J62] H. Zhang, W. Pang and E. S. Kim, "Miniature High Frequency Longitudinal Wave Mass Sensors in Liquid," IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, vol. 58, no. 1, pp. 255-258, 2010.

[J61] H. Zhang, W. Pang, E. S. Kim and H. Yu, "Micromachined Silicon and Polymer Probes Integrated with Film Bulk Acoustic Resonator Mass Sensors," Journal of Micromechanics and Microengineering, vol. 20, no. 12, pp. 125008 (9pp), 2010.

[J60] W. Pang, H. Zhang, R.C. Ruby, H. Yu, and E.S. Kim, "*Analytical and experimental study on the second harmonic mode of bulk acoustic wave resonator*," Journal of Micromechanics and Microengineering, vol. 20, no. 11, pp. 115015 (10pp), 2010.

[J59] H. Zhang, W. Pang, M.S. Marma, C.Y. Lee, S. Kamal-Bahl, E.S. Kim, and C.E. McKenna, "*Label-Free Detection of Protein-Ligand Interactions in Real Time Using Micromachined Bulk Acoustic Resonators*," Applied Physics Letter, vol. 96, no. 12, 123702, 2010.

[J58] J. Zhu, C. Lee, E.S. Kim, D. Wu, C. Hu, Q. Zhou, K.K. Shung, and H. Yu, "*High-overtone Self-Focusing Acoustic Transducers for High Frequency Ultrasonic Doppler*," Ultrasonics, vol. 50, no. 6, pp. 544-547, 2010.

[J57] J. Lo, P. Butte, Q. Fang, S.-J. Chen, T. Papaioannou, E.S. Kim, M. Gundersen, and L. Marcu, "Multilayered MOEMS Tunable Spectrometer for Fluorescence Lifetime Detection," IEEE Photonics Technology Letters, vol. 22, no. 7, pp. 486 – 488, 2010.

[J56] L. Ai, H. Yu, A. Paraboschi, F. Yu, E.S. Kim, R. Li and T.K. Hsiai, *"Optimization of Intravascular Shear Stress Assessment in Vivo,"* Journal of Biomechanics, vol. 42, no. 10, pp. 1429-1437, 2009.

[J55] J. Lo, S.-J. Chen, Q. Fang, T. Papaioannou, E.S. Kim, M. Gundersen and L. Marcu, "Performance of Diaphragmed Microlens for a Packaged Microspectrometer," Sensors, vol. 9, no. 2, pp. 859-868, 2009.

[J54] H. Yu, C. Lee, W. Pang, H. Zhang, A. Brannon, J. Kitching, and E.S. Kim, "*HBAR-Based 3.6 GHz Oscillator with Low Power Consumption and Low Phase Noise*," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency, vol. 56, no. 2, pp. 400 – 403, 2009.

[J53] C.Y. Lee, H. Yu, S.C. Hill, W. Pang, and E.S. Kim, "*Airborne particle generation through acoustic ejection of particles-in-droplets,*" Aerosol Science & Technology, vol. 42, no. 10, pp. 832-841, 2008.

[J52] C.Y. Lee, W. Pang, H. Yu, and E.S. Kim, "*Subpicoliter Droplet Generation Based on a Nozzle-free Acoustic Transducer,*" Applied Physics Letters, vol. 93, 034104, 2008.

[J51] H. Yu, L. Ai, M. Rouhanizadeh, D. Patel, E.S. Kim, and T.K. Hsiai, "*Flexible Polymer Sensors for In Vivo Intravascular Shear Stress Analysis*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 17, no. 5, pp. 1178 – 1186, 2008.

[J50] J.M. Cannata, J.A. Williams, Q.F. Zhou, L. Sun, K. K. Shung, H. Yu, and E. S. Kim, "Self-focused ZnO Transducers for Ultrasonic Biomicroscopy," Journal of Applied Physics, 103: 084109, 2008.

[J49] C.Y. Lee, W. Pang, S. Chen, D. Chi, H. Yu, and E.S. Kim, "*Surface Micromachined, Complementary-Metal-Oxide-Semiconductor Compatible Tunable Capacitor with 14:1 Continuous Tuning Range,*" Applied Physics Letters, vol. 92, 044103, 2008.

[J48] C.Y. Lee, H. Yu, and E.S. Kim, "*Droplet-Based Microreactions with Oil Encapsulation*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 17, no. 1, pp. 147 - 156, 2008.

[J47] Q. Zou, W. Tan, E.S. Kim and G.E. Loeb, "*Single-axis and Tri-axis Piezoelectric Bimorph Accelerometer*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 17, no. 1, pp. 45 – 57, 2008.

[J46] H. Zhang, M.S. Marma, S. Kamal-Bahl, E.S. Kim, and C.E. McKenna, "*Sequence Specific Label-Free DNA Sensing Using Film-Bulk-Acoustic-Resonators*," IEEE Sensors Journal, vol. 7, no 12, pp. 1587-1588, 2007.

[J45] H. Yu, W. Pang, H. Zhang and E.S. Kim, "*Ultra Temperature-Stable Bulk-Acoustic-Wave Resonators with SiO2 Compensation Layer*," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency, vol. 54, no. 10, pp. 2102 – 2109, 2007.

[J44] W. Pang, H. Zhang, H. Yu and E.S. Kim, "*Electrical Frequency Tuning of Film Bulk Acoustic Resonator,*" IEEE/ASME Journal of Microelectromechanical Systems, vol. 16, no. 6, pp. 1303 – 1313, 2007.

[J43] C.Y. Lee, S. Kamal-Bahl, H. Yu, J.W. Kwon and E.S. Kim, "*On-Demand DNA Synthesis on Solid Surface by Four Directional Ejectors on a Chip*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 16, no. 5, pp. 1130-1139, 2007.

[J42] H. Zhang, M.S. Marma, E.S. Kim, C.E. McKenna and M.E. Thompson, "*Mercuric Ion Sensing by Film-Bulk-Acoustic-Resonator*," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, vol. 54, no. 9, pp. 1723-1725, 2007.

[J41] Q.F. Zhou, C. Sharp, J.M. Cannata, K.K. Shung, G.H. Feng and E.S. Kim, "*Self-focusing High Frequency Ultrasonic Transducers Based on ZnO Piezoelectric Films*," Applied Physics Letters, vol. 90, 113502, 2007.

[J40] H. Yu, Q. Zou, J.W. Kwon, D. Huang and E.S. Kim, "*Liquid Needle*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 16, no. 2, pp. 445 - 453, 2007.

[J39] H. Zhang, W. Pang, H. Yu and E.S. Kim, "*High-tone Bulk Acoustic Resonators on Sapphire, Crystal Quartz, Fused Silica and Silicon Substrates*," Journal of Applied Physics, vol. 99, 124911, 2006.

[J38] C.Y. Lee, H. Yu and E.S. Kim, "*Nanoliter Droplet Coalescence in Air by Directional Acoustic Ejection*," Applied Physics Letters, vol. 89, 223902, 2006.

[J37] W. Pang, L. Yan, H. Zhang, H. Yu, E.S. Kim and W.C. Tang, "*Femtogam Mass Sensing Platform Based on Lateral-extensional-mode (LEM) Piezoelectric Resonator*," Applied Physics Letters, vol. 88, 243503, 2006.

[J36] J.W. Kwon, H. Yu, Q. Zou and E.S. Kim, "*Directional Ejection of Liquid Droplets by Sectored Self-Focusing Acoustic Transducers Built on ZnO and PZT*," Journal of Micromechanics and Microengineering, vol. 16, no. 12, pp. 2697-2704, 2006.

[J35] C.Y. Lee and E.S. Kim, "*Piezoelectrically Actuated Tunable Capacitor,"* IEEE/ASME Journal of Microelectromechanical Systems, vol. 15, no. 4, pp. 745-755, 2006.

[J34] H. Yu, J.W. Kwon and E.S. Kim, "*Microfluidic Mixer and Transporter Based on PZT Self-Focusing Acoustic Transducers,"* IEEE/ASME Journal of Microelectromechanical Systems, vol. 15, no. 4, pp. 1015-1024, 2006.

[J33] L. Yan, W. Pang, E.S. Kim and W.C. Tang, "*Single-chip Multiple-frequency VHF Low Impedance Micro Piezoelectric Resonators*," IEEE Electron Device Letters, vol. 27, no. 4, pp. 246-248, 2006.

[J32] J.W. Kwon, S. Kamal-Bahl and E.S. Kim, "*In-situ DNA Synthesis on Glass Substrate for Microarray Fabrication Using Self-Focusing Acoustic Transducer*," IEEE Transactions on Automation Science and Engineering, vol. 3, no. 2, pp. 152-158, 2006.

[J31] L. Yan, W. Pang, E.S. Kim and W.C. Tang, "*Piezoelectrically-transduced Low-impedance Microelectromechanical Resonators*," Applied Physics Letters, vol. 87, no. 15, 154103, 2005.

[J30] J.W. Kwon, H. Yu and E.S. Kim, "*Film Transfer and Bonding Techniques for Covering Single-Chip Ejector Array with Microchannels and Reservoirs*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 14, no. 6, pp. 1399-1408, 2005.

[J29] W. Pang, H. Zhang, H. Yu and E.S. Kim, "*Micromachined Acoustic Wave Resonator Isolated from Substrate*," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, vol. 52, no. 8, pp. 1239-1246, 2005.

[J28] H. Zhang, M. Marma, E.S. Kim, C. McKenna and M. Thompson, "*A Film Bulk Acoustic Resonator in Liquid Environments*," Journal of Micromechanics and Microengineering, vol. 15, no. 10, pp. 1911-1916, 2005.

[J27] W. Pang, H. Yu, H. Zhang, and E.S. Kim, "*Temperature Compensated Film Bulk Acoustic Resonator above 2GHz*," IEEE Electron Device Letters, vol. 26, no. 6, pp. 369-371, 2005.

[J26] S.H. Yi and E.S. Kim, "*Micromachined Piezoelectric Microspeaker*," Japanese Journal of Applied Physics, vol. 44, no. 6A, pp. 3836-3841, 2005.

[J25] H. Zhang and E.S. Kim, "*Micromachined Acoustic Resonant Mass Sensor*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 14, no. 4, pp. 699-706, 2005.

[J24] J.W. Kwon and E.S. Kim, "*Fine ZnO Patterning with Controlled Sidewall-Etch-Front Slope*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 14, no. 3, pp. 603-609, 2005.

[J23] C.H. Han and E.S. Kim, "*Simulation of Piezoelectric Dome-Shaped-Diaphragm Acoustic Transducers*," Journal of Semiconductor Technology and Science, vol. 5, no.1, pp. 17-23, 2005.

[J22] G.-H. Feng and E.S. Kim, "*Piezoelectrically Actuated Dome-Shaped-Diaphragm Micropump*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 14, no.2, pp. 192-199, 2005.

[J21] H. Yu, J.W. Kwon and E.S. Kim, "*Chembio Extraction on a Chip by Nanoliter Droplet Ejection*," Lab on a Chip, vol. 5, no. 3, pp. 344 – 349, 2005.

[J20] G.-H. Feng, C.C. Sharp, Q.F. Zhou, W. Pang, E.S. Kim and K.K. Shung, "*Fabrication of MEMS ZnO Dome-Shaped-Diaphragm Tranducers for High Frequency Ultrasonic Imaging*," Journal of Micromechanics and Microengineering, vol. 15, no. 3, pp. 586-590, 2005.

[J19] G. Soundararajan, M. Rouhanizadeh, H. Yu, L. DeMaio, E.S. Kim and T.K. Hsiai, "*MEMS Shear Stress Sensors for Microcirculation*," Sensors and Actuators A: Physical, vol. 118, no. 1, pp. 25-32, 2005.

[J18] G.-H. Feng and E.S. Kim, " *Micropump Based on PZT Unimorph and One-Way Parylene Valves*," Journal of Micromechanics and Microengineering, vol. 14, no. 4, pp. 429-435, 2004.

[J17] M. Niu and E.S. Kim, "*Piezoelectric Bimorph Microphone Built on Micromachined Parylene Diaphragm*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 12, pp. 892-898, December 2003.

[J16] S.H. Yi, F. von Preissig and E.S. Kim, "*Electroless Nickel Films: Properties and Fabricated Cavity Structure*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 11, pp. 293-301, August 2002.

[J15] J.W. Kwon and E.S. Kim, "*Multi-Level Microfluidic Channel Routing with Protected Convex Corners,*" Sensors and Actuators: A. Physical, vol. 97-98, pp. 729-733, April 2002.

[J14] D. Huang and E.S. Kim, "*Micromachined Acoustic-Wave Liquid Ejector*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 10, pp. 442-449, September 2001.

[J13] B. Lee and E.S. Kim, "*Analysis of Partly-Corrugated Rectangular Diaphragms Using the Rayleigh Ritz Method*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 9, pp. 399-406, September 2000.

[J12] B. Lee and E.S. Kim, "*A Simple and Efficient Method of Analyzing Mechanical Behaviors of Multi-layered Orthotropic Plates in Rectangular Shape*," Journal of Micromechanics and Microengineering, vol. 9, pp. 385-393, December 1999.

[J11] C.-H. Han and E.S. Kim, "*Study of Self-Limiting Etching Behavior in Wet Isotropic Etching of Silicon*," Japanese Journal of Applied Physics, vol. 37, pp. 6939-6941, December 1998.

[J10] F. von Preissig, H. Zeng and E.S. Kim, "*Measurement of Piezoelectric Strength in ZnO Thin Films for MEMS Applications*," Journal of Smart Materials and Structures, vol. 7, pp. 396-403, June 1998.

[J9] X. Zhu and E.S. Kim, "*Microfluidic Motion Generation with Acoustic Waves,*" Sensors and Actuators: A. Physical, vol. 66/1-3, pp. 355-360, April 1998.

[J8] E. Tran, E.S. Kim and S.Y. Lee, "*Fabrication of Mesas and Octagonal Cones in Silicon by Wet Chemical Etching*," Journal of Micromechanics and Microengineering, vol. 5, pp. 251-256, September 1995.

[J7] Y. Song, E.S. Kim and A. Kapila, "*Thermal Stability of Sputter-Deposited ZnO Thin Films*," TMS/IEEE Journal of Electronic Materials, vol. 24, pp. 83-86, February 1995.

[J6] A.D. Sathe and E.S. Kim, "*Deposition of Thin Film ZnO with Characteristics Close to Bulk Crystal ZnO*," Integrated Ferroelectrics, vol. 5, pp. 245-254, November 1994.

[J5] R.P. Ried, E.S. Kim, D.M. Hong and R.S. Muller, "*Piezoelectric Microphone with On-Chip CMOS Circuits*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 2, pp. 111-120, September 1993.

[J4] A.K. Aggarwal and E.S. Kim, "*Comments on 'Modeling of Quantum-Well Lasers for Computer-Aided Analysis of Optoelectronic Integrated Circuits'*," IEEE Journal of Quantum Electronics, vol. 29, p. 2414, August 1993.

[J3] E.S. Kim, R.S. Muller and R.S. Hijab, "*Front-to-Backside Alignment Using Resist-Patterned Etch Control and One Etching Step*," IEEE/ASME Journal of Microelectromechanical Systems, vol. 1, pp. 95-99, June 1992.

[J2] R.A. Stewart, J.R. Kim, E.S. Kim, R.M. White and R.S. Muller, "*Young's Modulus and Residual Stress of LPCVD Silicon-rich Silicon Nitride Determined from Membrane Deflection*," Sensors and Materials, vol. 2, pp. 285-298, May 1991.

[J1] E.S. Kim and R.S. Muller, "*IC-Processed Piezoelectric Microphone*," IEEE Electron Device Letters, vol. EDL-8, No.10, pp. 467-468, Oct. 1987.

Refereed Conference Papers

162

[C162] K. Sadeghian Esfahani, Y. Tang, J. Lee, M. Barekatain, and E.S. Kim, "Underwater Acoustic Tweezers Capable of Trapping Large and Heavy Particles," Hilton Head Workshop 2022: A Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, June 5 - 9, 2022, pp. 43 - 46.

[C161] H. Liu, A. Roy, Y. Tang, M. Barekatain, and E.S. Kim, "Ultrasonic Air-Borne Propulsion Through Synthetic Jets," Hilton Head Workshop 2022: A Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, June 5 - 9, 2022, pp. 226 - 229.

[C160] J. Lee and E.S. Kim, "Wireless and Stand-Alone Submarine Propeller Based on Acoustic Propulsion," Hilton Head Workshop 2022: A Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, June 5 - 9, 2022, pp. 230 - 233.

[C159] J. Lee and E.S. Kim, "*Phase Array Ultrasonic Transducer Based on a Flip Chip Bonding with Indium Solder Bump*," 2021 IEEE International Ultrasonics Symposium (IUS), 2021, pp. 1-4, doi: 10.1109/IUS52206.2021.9593776.

[C158] L. Zhao and E.S. Kim, "*Subminiature Underwater Propeller with Electrical Controllability of Steering*," 2021 IEEE International Ultrasonics Symposium (IUS), 2021, pp. 1-4, doi: 10.1109/IUS52206.2021.9593504.

[C157] S. Chang, Y. Tang and E.S. Kim, "*Low Intensity Focused-Ultrasound Stimulation on Hippocampal Neurons in Rat Brain Slices with Self-Focusing Acoustic Transducer*," The 12th Scientific Meeting for the Asian Australasian Society of Stereotactic and Functional Neurosurgery, Gyeongju, Korea, September 17 –19, 2020.

[C156] Y. Tang, S. Liu and E.S. Kim, "*MEMS Focused Ultrasonic Transducer with Air-Cavity Lens Based on Polydimethylsiloxane (PDMS) Membrane*," The 33rd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2020), Vancouver, Canada, January 18-22, 2020, pp. 58 - 61.

[C155] H. Liu, S. Liu and E.S. Kim, "*Multi-Band MEMS Resonant Microphone Array for Continuous Lung-Sound Monitoring and Classification*," The 33rd IEEE International Conference

on Micro Electro Mechanical Systems (MEMS 2020), Vancouver, Canada, January 18-22, 2020, pp. 857 - 860. Outstanding Student Paper Award Nominee.

[C154] K. Dixit, P. Ghelich, L. Zhao, E.S. Kim, and M. Han, "*A Chronic Assembly for an Implantable Focused Ultrasound Stimulator in the Rat Spinal Cord*," in North American Neuromodulation Society Annual Conference, Las Vegas, NV, January 23–26, 2020, Program No. PS7.

[C153] H. Liu, S. Liu, A. Shkel, Y. Tang, and E.S. Kim, "*MEMS Resonant Microphone Array for Lung Sound Classification*," IEEE International Electron Devices Meeting, San Francisco, CA, December 9 - 11, 2019, pp 811-814.

[C152] Y. Tang and E.S. Kim, "*Acoustic Droplet-Assisted Particle Ejection through and from Agarose-gel-filled Petri Dish*," IEEE International Ultrasonics Symposium, Glasgow, UK, October 6 - 9, 2019, pp. 64-67.

[C151] L. Zhao and E.S. Kim, "*Acoustic Tweezers with Electrical Controllability on Rotation of Trapped Particle*," IEEE International Ultrasonics Symposium, Glasgow, UK, October 6 - 9, 2019, pp. 663-666.

[C150] Y. Tang and E.S. Kim, "*Acoustic Propeller Based on Air Jets from Acoustic Streaming*," Transducers '19, The 20th International Conference on Solid-State Sensors, Actuators and Microsystems, Berlin, Germany, June 23 - 27, 2019, pp. 2068 - 2071.

[C149] L. Zhao and E.S. Kim, "*Acoustic Tweezers for Trapping Late-Stage Zebrafish Embryos*," The 32nd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2019), Seoul, Korea, January 27 - 31, 2019, pp. 57 - 60.

[C148] Y. Tang and E.S. Kim, "*Acoustic Tweezers Based on Linear Fresnel Lens with Air Cavities for Large Volume Particle Trapping*," The 32nd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2019), Seoul, Korea, January 27 - 31, 2019, pp. 763 - 766.

[C147] L. Zhao and E.S. Kim, "*Ultrasonic Propeller with Electrically Controllable Propulsion Direction*," IEEE International Ultrasonics Symposium, Kobe, Japan, October 22 - 25, 2018, pp. 1 - 3, doi: 10.1109/ULTSYM.2018.8580114.

[C146] L. Zhao and E.S. Kim, "*Focused Ultrasonic Transducer with Electrically Controllable Focal-Point Location*," IEEE International Ultrasonics Symposium, Kobe, Japan, October 22 - 25, 2018, pp. 1 - 3, doi: 10.1109/ULTSYM.2018.8580054.

[C145] Y. Tang and E.S. Kim, "*Electrical Tuning of Focal Size with Single Focused Ultrasonic Transducer*," IEEE International Ultrasonics Symposium, Kobe, Japan, October 22 - 25, 2018, pp. 1 - 4, doi: 10.1109/ULTSYM.2018.8579883.

[C144] A. Shkel, M. Barekatain and E.S. Kim, "*FBAR-Based Sensor for Wireless RFID Authentication of Integrated Circuits*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 3 - 7, 2018, pp. 190 - 193.

[C143] L. Zhao and E.S. Kim, "*Focused Ultrasound Transducer with Electrically Controllable Focal Length*," The 31st IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2018), Belfast, UK, January 21 - 25, 2018, pp. 245 - 248.

[C142] L. Zhao and E.S. Kim, "*Acoustic Tweezers for Sub-mm Microparticle Manipulation*," The 31st IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2018), Belfast, UK, January 21 - 25, 2018, pp. 1088 - 1091.

[C141] A. Shkel and E.S. Kim, "*Wearable Low-Power Wireless Lung Sound Detection Enhanced by Resonant Transducer Array for Pre-Filtered Signal Acquisition*," Transducers '17, The 19th International Conference on Solid-State Sensors, Actuators and Microsystems, Kaohsiung, Taiwan, June 18 - 22, 2017, pp. 842 - 845.

[C140] Y. Tang, L. Wang, Y. Wang and E.S. Kim, "*On-Demand, Heatless Ejection of Millimeter-Sized Liquid Droplets*," The 30th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2017), Las Vegas, NV, January 22 - 26, 2017, pp. 1196 - 1199.

[C139] A. Shkel and E.S. Kim, "*Helmholtz PMUT: Demonstrating Passive Amplification in Microfabricated Acoustic Transducers*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 5 -9, 2016, pp. 60 - 61.

[C138] Y. Wang, L. Zhao, A. Shkel, Y. Tang and E.S. Kim, "*Vibration Energy Harvester Based on Floating Magnet for Generating Power from Human Movement*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 5 -9, 2016, pp. 404 - 407.

[C137] Y. Tang, Y. Wang, L. Zhao, A. Shkel and E.S. Kim, "*Micromachined Piezoelectric Ultrasonic Transducer Based on Dome-Shaped Diaphragm Supported by Flat Square Diaphragm*," The 29th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2016), Shanghai, China, January 24 - 28, 2016, pp. 1110 - 1113.

[C136] Y. Wang, Q. Zhang, L. Zhao, A. Shkel, Y. Tang and E.S. Kim, "*Stackable Dual-Layer Coil Based on Wafer-Level Transfer Technique for Electromagnetic Energy Harvester*," The 29th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2016), Shanghai, China, January 24 - 28, 2016, pp. 1264 - 1267.

[C135] A. Shkel and E.S. Kim, "*Acoustic Micro-resonator Utilizing Hemispherical Air Cavity for Sensitivity Enhancement*," IEEE International Ultrasonics Symposium, DOI 10.1109/ULTSYM.2015.0359, Taipei, Taiwan, October 21 - 24, 2015.

[C134] Y. Wang, Q. Zhang, L. Zhao and E.S. Kim, "*Non-Resonant, Broad-Band Vibration-Energy Harvester Based on Self-Assembled Liquid Bearing*," Transducers '15, The 18th International

Conference on Solid-State Sensors, Actuators and Microsystems, Anchorage, AK, June 21 - 25, 2015, pp. 614 - 617.

[C133] A. Vafanejad and E.S. Kim, "*Effect of Diaphragm Perforation on Quality Factor of Hemispherical Resonance Gyroscope*," Transducers '15, The 18th International Conference on Solid-State Sensors, Actuators and Microsystems, Anchorage, AK, June 21 - 25, 2015, pp. 27 - 30.

[C132] Q. Zhang, Y. Wang, L. Zhao and E.S. Kim, "*Microfabricated Thousand-Turn Coils for mW Power Generation from Sub-mm Vibrations*," Transducers '15, The 18th International Conference on Solid-State Sensors, Actuators and Microsystems, Anchorage, AK, June 21 - 25, 2015, pp. 606 - 609.

[C131] Q. Zhang and E.S. Kim, "*Fully-Microfabricated Electromagnetically-Actuated Membrane for Microspeaker*," Transducers '15, The 18th International Conference on Solid-State Sensors, Actuators and Microsystems, Anchorage, AK, June 21 - 25, 2015, pp. 2125 - 2128.

[C130] Y. Wang, Q. Zhang, L. Zhao and E.S. Kim, "*Ferrofluid Liquid Spring for Vibration Energy Harvesting*," The 28th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2015), Estoril, Portugal, January 18-22, 2015, pp. 122-125.

[C129] A. Shkel, L. Baumgartel, and E.S. Kim, "*A Resonant Piezoelectric Microphone Array for Detection of Acoustic Signatures in Noisy Environments*," The 28th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2015), Estoril, Portugal, January 18-22, 2015, pp. 917-920.

[C128] A. Vafanejad and E.S. Kim, "*Sub-Degree Angle Detection Using Micromachined Dome-Shaped-Diaphragm Resonator With Wine-Glass Mode Vibration*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 8 -12, 2014, pp. 391 - 394.

[C127] A. Vafanejad and E.S. Kim, "*Dome-Shaped-Diaphragm Resonators with Wine-Glass Mode Vibration*," 10th International Workshop on Nanomechanical Sensing, Stanford, CA, May 1 - 3, 2013, pp. 171 - 172.

[C126] L. Wang, C.-P. Liao, M. Gross, and E.S. Kim, "*Self Focusing Acoustic Transducer (SFAT) with 10 mm Focal Length for Cancer-Specific Localized Cytolysis of 3D Cell Spheroids in 3D Matrigel*," Transducers '13, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, Barcelona, Spain, June 16 - 20, 2013, pp. 653-656.

[C125] Y. Choe, L. Wang, and E.S. Kim, "*In Situ Protein Synthesis on Glass Substrate with Acoustic Microdroplet Ejector with Air-Cavity Lens Formed by Micromachined Silicon*," Transducers '13, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, Barcelona, Spain, June 16 - 20, 2013, pp. 325 - 328.

[C124] Q. Zhang and E.S. Kim, "*Energy Harvesters with High Electromagnetic Conversion Efficiency through Magnet and Coil Arrays*," IEEE International Micro Electro Mechanical Systems Conference, Taipei, Taiwan, January 20–24, 2013, pp. 110 - 113.

[C123] L. Wang, Y. Li, A. Lin, Y. Choe, M. Gross, and E.S. Kim, "*Combinatory Localized Cytolysis with Micron Precision by Acoustic Transducer Array for Fast Screening of Drug Induced Cytoskeleton Alteration*," IEEE International Micro Electro Mechanical Systems Conference, Paris, France, Jan. 29 – Feb. 2, 2012, pp. 800 - 803.

[C122] E.S. Kim, "*Piezoelectric microspeakers built on various diaphragms*," 162nd Meeting: Acoustical Society of America, San Diego, CA, Oct. 31 – Nov. 4, 2011, Invited.

[C121] L. Wang, Y. Li, A. Lin, Y. Choe, M. Gross, and E.S. Kim, "*Micro-localized Cell Lysis by Low Power Focused Acoustic Transducer*," IEEE International Ultrasonics Symposium, Orlando, FL, October 18-21, 2011, pp. 1123 - 1126.

[C120] A. Lin, Y. Li, L. Wang, S.J. Chen, M. Gross, and E.S. Kim, " *Label-Free Detection of Prostate-Specific Antigen with FBAR-Based Sensor with Oriented Antibody Immobilization*," IEEE International Ultrasonics Symposium, Orlando, FL, October 18-21, 2011, pp. 797 - 800.

[C119] L. Wang, Y. Li, A. Lin, S.J. Chen, M. Gross, and E.S. Kim, "*Cell Lysis by Low Power Focused Acoustic Transducer and Investigation of Acoustic Intensity Threshold for Cytolysis of Various Cell Lines*," The 15th International Conference on Miniaturized Systems for Chemistry and Life Sciences (μTAS 2011), Seattle, WA, October 2 - 6, 2011, pp. 434 - 436.

[C118] S.J. Chen, A. Lin, and E.S. Kim, "*Frequency-multiplexed Combinatory Mass Sensing with Single Data Line from Multiple Integrated Film Bulk Acoustic Resonators*," Transducers '11, IEEE International Conference on Solid-State Sensors and Actuators, Beijing, China, June 5 - 9, 2011, pp. 783-786.

[C117] Y. Choe, L. Wang, and E.S. Kim, "*On-chip Integration of Eight Directional Droplet Ejectors for Inking a Spot with Eight Droplets without Ejector Movement*," Transducers '11, IEEE International Conference on Solid-State Sensors and Actuators, Beijing, China, June 5 - 9, 2011, pp. 2948-2951.

[C116] L. Wang, Y. Choe, S. J. Chen, L. Baumgartel, and E.S. Kim, "*MEMS Ultrasonic Transducers for Highly Sensitive Doppler Velocity Sensor for Low Velocity Measurement*," Transducers '11, IEEE International Conference on Solid-State Sensors and Actuators, Beijing, China, June 5 - 9, 2011, pp.719-722.

[C115] Q. Zhang, S.J. Chen, L. Baumgartel, A. Lin, and E.S. Kim, "*Microelectromagnetic Energy Harvester with Integrated Magnets*," Transducers '11, IEEE International Conference on Solid-State Sensors and Actuators, Beijing, China, June 5 - 9, 2011, pp.1657-1660.

[C114] Y. Choe, J.W. Kim, K.K. Shung, and E.S. Kim, "*Ultrasonic Microparticle Trapping by Multi-Foci Fresnel Lens*," Joint Conference of the IEEE International Frequency Control

Symposium and European Frequency and Time Forum, San Francisco, CA, May 1-5, 2011, Digital Object Identifier: 10.1109/FCS.2011.5977900.

[C113] S.J. Chen, A. Lin, and E.S. Kim, " *Multiplexed Film Bulk Acoustic Resonators for Mass Sensing Applications*," 2011 MRS Spring Meeting and Exhibit, San Francisco, CA, April 25 - 29, 2011, vol. 1348, CC03-04.

[C112] L. Wang, Y. Choe, and E. S. Kim, "*Electrical Control of Droplet Direction with Phase-Varied Fresnel Lens on Acoustic Wave Liquid Ejector*," IEEE International Micro Electro Mechanical Systems Conference, Cancun, Mexico, January 23 – 27, 2011, pp. 1115-1118.

[C111] Z. Wang, J. Zhu, X. Qiu, R. Tang, C. Yu, J. Oiler, E.S. Kim, and H. Yu, "*Directional Acoustic Underwater Thruster*," IEEE International Micro Electro Mechanical Systems Conference, Cancun, Mexico, January 23 – 27, 2011, pp. 1225-1228.

[C110] A. Lin, F.E. Sahin, S.J. Chen, P. Pham and E.S. Kim, "*Real-Time Label-Free Detection of DNA Synthesis by FBAR-Based Mass Sensing*," IEEE International Ultrasonics Symposium, San Diego, CA, October 11-14, 2010, pp. 1286-1289.

[C109] S.J. Chen, D. Chi, J.F. Lo, and E.S. Kim, "*Arrayed, Piezoelectrically-Actuated Mirrors and Gratings for Spectrometer* Technical Proceedings of the 2010 NSTI Nanotechnology Conference & Expo, Anaheim, CA, USA, June 21-25, 2010, vol. 2, pp. 312-315.

[C108] S.J. Chen, Y. Choe, and E.S. Kim, "*Frequency-Interleaved MEMS Ultrasound Transducer*," Technical Proceedings of the 2010 NSTI Nanotechnology Conference & Expo, Anaheim, CA, June 21-25, 2010, vol. 2, pp. 324 - 327.

[C107] Y. Choe, S.J. Chen, and E.S. Kim, "*High Fidelity Loud Microspeaker Based on PZT Bimorph Diaphragm*," Technical Proceedings of the 2010 NSTI Nanotechnology Conference & Expo, Anaheim, CA, June 21-25, 2010, vol. 2, pp. 316 - 319.

[C106] E.S. Kim, "*Acoustic MEMS Transducers for Biomedical Applications*," IEEE International Frequency Control Symposium, Newport Beach, CA, June 2-4, 2010, pp. 71 – 76, Invited.

[C105] S.J. Chen, Y. Choi, and E.S. Kim, "*Acoustic Transducers Built on Edge-Released MEMS Structures*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 6 -10, 2010, pp. 234 - 237.

[C104] L. Baumgartel and E.S. Kim, "*Use of Compressively-stressed Zinc Oxide to Dramatically Increase Microspeaker Displacement*," 159th Meeting of the Acoustical Society of America, Baltimore, MD, April 19-23, 2010, Proceedings of Meetings on Acoustics, Vol. 9, 030001 (2010).

[C103] Y. Choe, S.J. Chen, and E.S. Kim, "*Bimorph Diaphragm Formed by Two PZT Sheets on Micromachined Silicon for Sound Generation*," 6th International Conference and Exhibition on Device Packaging, Scottsdale/Fountain Hills, AZ, March 9-11, 2010, pp. 269-270.

[C102] L. Baumgartel and E.S. Kim, "*Experimental Optimization of Electrodes for High Q, High Frequency HBAR*," IEEE International Ultrasonics Symposium, Rome, Italy, September 20-23, 2009, pp. 2107 - 2110.

[C101] S.J. Chen, C.Y. Lee, and E.S. Kim, "*Integration of Tunable Capacitors and Bonded-Wires for Contactless RF Switch and Tunable Filter*," Transducers '09, IEEE International Conference on Solid-State Sensors and Actuators, Denver, CO, June 21 - 25, 2009, pp. 545 - 548.

[C100] J. Zhu, X. Qiu, J. Oiler, C. Yu, Z. Wang, C. Lee, T.K. Hsiai, E.S. Kim, and H. Yu, "*Localized Cell Lysis Using Self Focused Acoustic Transducers*," Transducers '09, IEEE International Conference on Solid-State Sensors and Actuators, Denver, CO, June 21 - 25, 2009, pp. 608 - 611.

[C99] S.H. Yi, S.C. Ur, and E.S. Kim, "*Performance of Packaged Piezoelectric Microspeakers Depending on the Material Propoerties*," IEEE International Micro Electro Mechanical Systems Conference, Sorrento, Italy, January 25 – 29, 2009, pp. 765 - 768.

[C98] A. Lin and E. S. Kim, "*Selectivity and Long-term Reliability of Resonant Explosive-Vapor-Trace Detection Based on Antigen-Antibody Binding*," IEEE International Micro Electro Mechanical Systems Conference, Sorrento, Italy, January 25 – 29, 2009, pp. 316 - 319.

[C97] E.S. Kim, "*Piezoelectric MEMS for Audio Signal Transduction, Microfluidic Management, Resonant Mass Sensing, and Movable Surface Micromachined Structures*," IEEE International Ultrasonics Symposium, Beijing, China, November 2-5, 2008, pp. 924 – 929, Invited.

[C96] H. Yu, L. Ai, M. Rouhanizadeh, T. K. Hsiai, and E. S. Kim, "*Flexible Shear Stress Sensor for In Vivo Cardiovascular Testing*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 1-5, 2008, pp. 142-145.

[C95] C. Lee, S. Chen, D. Chi, H. Yu, and E.S. Kim, " *Surface Micromachined GHz Tunable Capacitor with 14:1 Continuous Tuning Range*," IEEE International Micro Electro Mechanical Systems Conference, Tucson, AZ, January 13 – 17, 2008, pp. 1008-1011.

[C94] A. Lin, H. Yu, M. Waters, E. S. Kim, and S. D. Goodman, "*Explosive Trace Detection with FBAR-Based Sensor*," IEEE International Micro Electro Mechanical Systems Conference, Tucson, AZ, January 13 – 17, 2008, pp. 208-211.

[C93] J. Cannata, J. Williams, Q. Zhou, H. Yu, E. S. Kim, and K. K. Shung, " *Self-focused ZnO Transducers for Ultrasonic Biomicroscopy*," IEEE International Ultrasonics Symposium, New York, NY, October 28-31, 2007, pp. 945 - 948.

[C92] H. Yu, C. Lee, W. Pang, H. Zhang, and E.S. Kim, " *Low Phase Noise, Low Power Consuming 3.7 GHz Oscillator Based on High-overtone Bulk Acoustic Resonator*," IEEE International Ultrasonics Symposium, New York, NY, October 28-31, 2007, pp. 1160 - 1163.

[C91] H. Yu, D. Wu, C. Lee, Q. Zhou, E.S. Kim, and K.K. Shung, "*High-overtone Self-Focusing Acoustic Transducer for High Frequency Ultrasonic Imaging*," IEEE International Ultrasonics Symposium, New York, NY, October 28-31, 2007, pp. 2401 - 2404.

[C90] H. Yu, L. Ai, M. Rouhanizadeh, R. Hamilton, J. Hwang, E.S. Kim and T.K. Hsiai, "Flexible Catheter-Based Cardiovscular Shear Stress Sensor," 2007 BMES Annual Fall Meeting, Los Angles, CA, September 26-29, 2007, Presented.

[C89] C. Lee, H. Yu, and E.S. Kim, "*Harmonic Operation of Acoustic Transducer for Droplet Ejection Application*," Transducers '07, IEEE International Conference on Solid-State Sensors and Actuators, Lyon, France, June 10-14, 2007, pp. 1283-1286.

[C88] J.F. Lo, S. Chen, H. Yu, E.S. Kim, L. Marcu, and M. Gundersen, "*Multi-Cantilever-Driven Rotational Translation for Actuated Micro Optical Grating*," Transducers '07, IEEE International Conference on Solid-State Sensors and Actuators, Lyon, France, June 10-14, 2007, pp. 2421-2424.

[C87] H. Yu, L. Ai, M. Rouhanizadeh, R. Hamilton, J. Hwang, E. Meng, E.S. Kim and T.K. Hsiai, "Polymer-Based Cardiovascular Shear Stress Sensors," ASME Frontiers in Biomedical Devices Conference, Irvine, CA, June 7-8, 2007, BioMed2007-38089.

[C86] C. Lee, H. Yu, and E.S. Kim, "*Microreactions Using Nanoliter Droplets with Oil Encapsulation*," IEEE International Micro Electro Mechanical Systems Conference, Kobe, Japan, January 21 – 25, 2007, pp. 81-84.

[C85] J. Dutta, H. Yu, C. Lee, and E.S. Kim, "*Liquid Jet Propeller Integrated with Reservoir, Channel, and Cover*," IEEE International Micro Electro Mechanical Systems Conference, Kobe, Japan, January 21 – 25, 2007, pp. 683-686.

[C84] J.F. Lo, L. Marcu, and E.S. Kim, "*Wafer-Level Packaging of Three-Dimensional MOEMS Device with Lens Diaphragm*," IEEE International Micro Electro Mechanical Systems Conference, Kobe, Japan, January 21 – 25, 2007, pp. 715-718.

[C83] H. Zhang, Q. Zou, E.S. Kim, A.M. Madni, L.E. Costlow and R.F. Wells, "*Frequency-Mismatch-Tolerant Silicon Vibratory Gyroscope without Vacuum Package for Automotive Applications*," World Automation Congress, Budapest, Hungary, July 24-27, 2006, Tracking #ISIAC-244.

[C82] C. Lee, H. Yu, and E.S. Kim, "*Controlled Droplet Coalescence in Air and Its Application to Micromixing*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 4-8, 2006, pp. 106-107.

[C81] H. Yu, H. Zhang, W. Pang, and E.S. Kim, "*Temperature Stable, Post-Process Tunable, High Q HBARs at 3~5 GHz*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 4-8, 2006, pp. 332-335.

[C80] C. Lee, H. Yu, and E.S. Kim, "*Acoustic Ejector with Novel Lens Employing Air-Reflectors*," IEEE International Micro Electro Mechanical Systems Conference, Istanbul, Turkey, January 22 – 26, 2006, pp. 170-173.

[C79] H. Zhang, W. Pang and E.S. Kim, "*Micromachined SU-8 Probe Integrated with Film-bulk-acoustic Resonant Mass Sensor*," IEEE International Micro Electro Mechanical Systems Conference, Istanbul, Turkey, January 22 – 26, 2006, pp. 82-85.

[C78] W. Pang, L. Yan, H. Zhang, H. Yu, E.S. Kim and W.C. Tang, "*Ultra-sensitive Mass Sensor Based on Lateral Extensional Mode Piezoelectric Resonator*," IEEE International Micro Electro Mechanical Systems Conference, Istanbul, Turkey, January 22 – 26, 2006, pp. 78-81.

[C77] J. Lo, Q. Fang, W. Pang, T. Papaioannou, Q. Shui, E.S. Kim, M.A. Gundersen and L. Marcu, (Invited Paper), "*Packaging and Characteristics of a Micro Fluorescence Spectroscopy Analyzer*," SPIE International Symposium on Biomedical Optics 2006, San Jose, California, January 21-26, 2006, Proceedings of SPIE, vol. 6080, 60800H (Feb. 25, 2006).

[C76] H. Zhang, M. Marma, E.S. Kim, C. McKenna and M. Thompson, "*Mercury Ion Sensing by Film-Bulk-Acoustic-Resonator Mass Sensor*," IEEE Conference on Sensors (Irvine, CA), Oct. 31 - Nov. 3, 2005, pp. 203-206.

[C75] W. Pang, H. Zhang and E.S. Kim, "*Analytical and Experimental Study on Second Harmonic Response of FBAR for Oscillator Application*," IEEE International Ultrasonics Symposium, Rotterdam, The Netherlands, September 18-21, 2005, pp. 2136-2139.

[C74] S. Kamal-Bahl and E.S. Kim, "*DNA Microarray Fabrication Using Directional Self-Focusing Acoustic Transducer Array*," IEEE International Ultrasonics Symposium, Rotterdam, The Netherlands, September 18-21, 2005, pp. 960-963.

[C73] H. Zhang, W. Pang and E.S. Kim, "*High-frequency Bulk Acoustic Resonant Microbalances in Liquid*," Joint IEEE International Frequency Control Symposium and Precise Time and Time Interval (PTTI) Systems and Applications Meeting, Vancouver, Cananda, August 29-31, 2005, pp. 73-77.

[C72] W. Pang, H. Zhang, J.J. Kim, H. Yu and E.S. Kim, "*High-Tone Bulk Acoustic Resonator Integrated with Surface Micromachined FBAR Filter on a Single Chip*," Transducers '05, IEEE International Conference on Solid-State Sensors and Actuators, Seoul, Korea, June 5-9, 2005, pp. 2057-2060.

[C71] J.J. Kim, H. Zhang, W. Pang, H. Yu and E.S. Kim, "*Low Phase Noise, FBAR-Based Voltage Controlled Oscillator without Varactor*," Transducers '05, IEEE International Conference on Solid-State Sensors and Actuators, Seoul, Korea, June 5-9, 2005, pp. 1063-1066.

[C70] J.W. Kwon, S. Kamal-Bahl and E.S. Kim, "*Film Transfer and Bonding Technique to Cover Lab on a Chip*," Transducers '05, IEEE International Conference on Solid-State Sensors and Actuators, Seoul, Korea, June 5-9, 2005, pp. 940-943.

[C69] H. Zhang, J.J. Kim, W. Pang, H. Yu and E.S. Kim, "*5GHz Low-phase-noise Oscillator Based on FBAR with Low TCF*," Transducers '05, IEEE International Conference on Solid-State Sensors and Actuators, Seoul, Korea, June 5-9, 2005, pp. 1100-1101.

[C68] S.H. Yi, Y.H. Park, S.O. Han, S.H. Han, N.K. Min, E.S. Kim and T.H. Ahn, "*Novel NDIR CO2 Sensor for Indoor Air Quality Monitoring*," Transducers '05, IEEE International Conference on Solid-State Sensors and Actuators, Seoul, Korea, June 5-9, 2005, pp. 1211-1214.

[C67] W. Pang, H. Yu, H. Zhang and E.S. Kim, "*Electrically Tunable and Temperature Compensated FBAR*," IEEE MTT-S 2005 International Microwave Symposium, Long Beach, California, June 12 - 17, 2005, Technical Digest (ISBN:0-7803-8846-1).

[C66] W. Pang, H. Zhang, J.J. Kim, H. Yu and E.S. Kim, "*High Q Single-Mode High-Tone Bulk Acoustic Resonator Integrated with Surface-Micromachined FBAR Filter*," IEEE MTT-S 2005 International Microwave Symposium, Long Beach, California, June 12 - 17, 2005, Technical Digest (ISBN:0-7803-8846-1).

[C65] H. Yu, W. Pang, H. Zhang and E.S. Kim, "*Film Bulk Acoustic Resonator at 4.4 GHz with Ultra Low Temperature Coefficient of Resonant Frequency*," IEEE International Micro Electro Mechanical Systems Conference, Miami, Florida, January 30 – February 3, 2005, pp. 28-31.

[C64] J. Lo, E.S. Kim, M.A. Gundersen and L. Marcu, "*Piezoelectric Optical MEMS Scanning Fluorescence Biosensor*," SPIE International Symposium on Biomedical Optics 2005, San Jose, California, January 22-27, 2005, Proc. SPIE vol. 5692, pp. 103-110.

[C63] G.E. Loeb, W. Tan, N. Sachs, Q. Zou and E.S. Kim, "*A Modular Approach to Sensing Limb Position in FES Patients*," Proc. 9th Ann. Mtg. International Functional Electrical Stimulation Soc., Bournemouth, U.K., Sept. 6-9, 2004 (http://www.ifessnet2004.tk/).

[C62] Q. Zou, W. Tan, E.S. Kim, J. Singh and G.E. Loeb, "*Implantable Biaxial Piezoresistive Accelerometer for Sensorimotor Control*," IEEE Engineering in Medicine and Biology Society (EMBS) Annual Conference (San Francisco, California), September 1-5, 2004, pp. 4279-4282.

[C61] W. Tan, Q. Zou, E.S. Kim and G.E. Loeb, "*Sensing Human Arm Postureition and Orientation with Implantable Sensors*," IEEE Engineering in Medicine and Biology Society (EMBS) Annual Conference (San Francisco, California), September 1-5, 2004, pp. 4290-4293.

[C60] W. Pang, H. Zhang, H. Yu and E.S. Kim, "*Electrically Tunable and Switchable Film Bulk Acoustic Resonator*," IEEE International Frequency Control Symposium (Montreal, Canada), August 24-27, 2004, pp. 22-26.

[C59] W. Pang, H. Yu, H. Zhang and E.S. Kim, "*Self-Aligned Lateral Field Excitation Film Acoustic Resonator with Very Large Electromechanical Coupling*," IEEE International Frequency Control Symposium (Montreal, Canada), August 24-27, 2004, pp. 558-561.

[C58] G.-H Feng, C. Sharp, Q.F. Zhou, E.S. Kim and K.K. Shung, "*Fabrication of Dome-Shaped-Diaphragm-Transducer Array for High Frequency Biomedical Image Application*," IEEE International Ultrasonics Symposium (Montreal, Canada), August 24-27, 2004, pp. 1950-1953.

[C57] C. Sharp, G.-H. Feng, Q.F. Zhou, J. Cannata, E.S. Kim and K.K. Shung, "*200 MHz Self-Focused ZnO MEMS Ultrasonic Transducers for Biomedical Imaging*," IEEE International Ultrasonics Symposium (Montreal, Canada), August 24-27, 2004, pp. 1946-1949.

[C56] L. Yan, W. Pang, J. Wu, W.C. Tang and E.S. Kim, "*High Frequency Micromechanical Piezo Actuated Disk Resonator*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 6-10, 2004, pp. 372-375.

[C55] W. Pang, H. Zhang, S. Whangbo and E.S. Kim, "*High Q Film Bulk Acoustic Resonator from 2.4 to 5.1GHz*," IEEE International Micro Electro Mechanical Systems Conference, Maastricht, The Netherlands, January 25-29, 2004, pp. 805-808.

[C54] H. Yu and E.S. Kim, "*Ultrasonic Underwater Thruster*," IEEE International Micro Electro Mechanical Systems Conference, Maastricht, The Netherlands, January 25-29, 2004, pp. 486-489.

[C53] H. Zhang, M. Marma, E.S. Kim, C. McKenna and M. Thompson, "*Implantable Resonant Mass Sensor For Liquid Bio-chemical Sensing*," IEEE International Micro Electro Mechanical Systems Conference, Maastricht, The Netherlands, January 25-29, 2004, pp. 347-350.

[C52] Q. Zou, W. Tan, E.S. Kim, and G.E. Loeb, "*Highly Symmetric Tri-axis Piezoelectric Bimorph Accelerometer*," IEEE International Micro Electro Mechanical Systems Conference, Maastricht, The Netherlands, January 25-29, 2004, pp. 197-200.

[C51] H. Yu and E.S. Kim, "*Liquid Separation for Chemical Extraction by Large Droplet Ejection and Millimeter High Liquid Fountain*," Transducers '03, IEEE International Conference on Solid-State Sensors and Actuators (Boston, MA), June 8-12, 2003, pp. 611-614.

[C50] Q. Zou, Wei Tan, E.S. Kim, and Gerald E. Loeb "*Implantable Bimorph Piezoelectric Accelerometer for Feedback Control of Functional Neuromuscular Stimulation*," Transducers '03, IEEE International Conference on Solid-State Sensors and Actuators (Boston, MA), June 8-12, 2003, pp. 1379-1382.

[C49] K. Lee, S. Park and E.S. Kim, "*Improved Electromagentic Displacement Transducer with Large Force for Implantable Middle Ear Hearing Aid*," Transducers '03, IEEE International Conference on Solid-State Sensors and Actuators (Boston, MA), June 8-12, 2003, pp. 1217-1220.

[C48] H. Zhang and E.S. Kim, "*Vapor and Liquid Mass Sensing by Micromachined Acoustic Resonator*," IEEE International Micro Electro Mechanical Systems Conference, Kyoto, Japan, January 19-23, 2003, pp. 470-473.

[C47] H. Yu and E.S. Kim, "*Micropropulsion of Air and Liquid Jet by Acoustic Streaming*," IEEE International Micro Electro Mechanical Systems Conference, Kyoto, Japan, January 19-23, 2003, pp. 76-79.

[C46] G.-H. Feng and E.S. Kim, "*Universal Concept for Fabricating Micron to Millimeter Sized 3-D Parylene Structures on Rigid and Flexible Substrates*," IEEE International Micro Electro Mechanical Systems Conference, Kyoto, Japan, January 19-23, 2003, pp. 594-597.

[C45] H. Zhang and E.S. Kim, "*Air-backed Al/ZnO/Al Film Bulk Acoustic Resonator without Any Support Layer*," IEEE International Frequency Control Symposium, New Orleans, LA, May 29-31, 2002, pp. 20-26.

[C44] J.W. Kwon and E.S. Kim, "*Fine ZnO Patterning with Controlled Sidewall-Etch-Front Slope*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 2 - 6, 2002, pp. 223-226.

[C43] H. Yu and E.S. Kim, "*Large Area Microfluidic Mixer Integrated with Linear Fluidic Transporters and Reservoirs*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 2 - 6, 2002, pp. 362-365.

[C42] S.H. Yi and E.S. Kim, "*Piezoelectric Micro-speaker with Compressive Nitride Diaphragm*," IEEE International Micro Electro Mechanical Systems Conference, Las Vegas, Nevada, January 20-24, 2002, pp. 260-263.

[C41] J.W. Kwon, Q. Zou and E.S. Kim, "*Directional Ejection of Liquid Droplets through Sectoring Half-Wave-Band Sources of Self-Focusing Acoustic Transducer*," IEEE International Micro Electro Mechanical Systems Conference, Las Vegas, Nevada, January 20-24, 2002, pp. 121-124.

[C40] H. Yu and E.S. Kim, "*Noninvasive Acoustic-Wave Microfluidic Driver*," IEEE International Micro Electro Mechanical Systems Conference, Las Vegas, Nevada, January 20-24, 2002, pp. 125-128.

[C39] S.H. Yi and E.S. Kim, "*Piezoelectric Bimorph Microphone with Serial Electrical Connection*," International Mechanical Engineering Congress and Exposition, Symposium on Microelectromechanical Systems (New York, NY), November 11-16, 2001, CD Index No. MEMS-23857 (7 pages).

[C38] J.W. Kwon and E.S. Kim, "*Microfluidic Channel Routing with Protected Convex Corners*," Transducers '01, IEEE International Conference on Solid-State Sensors and Actuators (Munich, Germany), June 10-14, 2001, pp. 644-647.

[C37] Q. Zou, D. Huang and E.S. Kim, "*Water Needle – A New Phenomenon for Ink-Jet Printing*," Transducers '01, IEEE International Conference on Solid-State Sensors and Actuators (Munich, Germany), June 10-14, 2001, pp. 894-897.

[C36] M. Niu and E.S. Kim, "*Bimorph Piezoelectric Acoustic Transducer*," Transducers '01, IEEE International Conference on Solid-State Sensors and Actuators (Munich, Germany), June 10-14, 2001, pp. 110-113.

[C35] C.-H. Han and E.S. Kim, "*Fabrication of Piezoelectric Acoustic Transducers Built on Cantilever-like Diaphragm*," IEEE International Micro Electro Mechanical Systems Conference, Interlaken, Switzerland, January 21-25, 2001, pp. 110-113.

[C34] M. Niu, F. von Preissig and E.S. Kim, "*Partially Etched Holes for Residual Stress Release in Diaphragm-Based Pressure Sensors*," International Mechanical Engineering Congress and Exposition, Symposium on Microelectromechanical Systems (Orlando, FL), November 5-10, 2000, MEMS-Vol. 2, pp. 227-232.

[C33] M. Niu and E.S. Kim, "*Residual Stress Effect on Performance of Diaphragm-Based MEMS Pressure Transducers*," International Mechanical Engineering Congress and Exposition, Symposium on Microelectromechanical Systems (Orlando, FL), November 5-10, 2000, MEMS-Vol. 2, pp. 269-274.

[C32] C.-H. Han and E.S. Kim, "*Packaged Parylene-Diaphragm Piezoelectric Microspeaker*," International Mechanical Engineering Congress and Exposition, Symposium on Microelectromechanical Systems (Orlando, FL), November 5-10, 2000, MEMS-Vol. 2, pp. 111-115.

[C31] C.-H. Han and E.S. Kim, "*Micromachined Piezoelectric Ultrasonic Transducers Based on Parylene Diaphragm in Silicon Substrate*," IEEE International Ultrasonics Symposium (San Juan, Puerto Rico), October 22-25, 2000, pp. 919-923.

[C30] S.H. Yi, F. von Preissig and E.S. Kim, "*The Effects of Process Conditions on the Residual Stress and Composition of Electroless Nickel Films for MEMS*," 197th ECS Meeting (Toronta, Canada), May 14-18, 2000, Electrochemical Society Proceedings Volume 2000-8, pp. 186 - 194.

[C29] F. von Preissig and E.S. Kim, "*Topics in Finite-Element Modeling of Piezoelectric MEMS Devices*," Third International Conference on Modeling and Simulation of Microsystems, San Diego, CA, March 27-29, 2000, pp. 269-272.

[C28] V. Vivek, Y. Zeng and E.S. Kim, "*Novel Acoustic-Wave Micromixer*," IEEE International Micro Electro Mechanical Systems Conference, Miyazaki, Japan, January 23-27, 2000, pp. 668-673.

[C27] C.-H. Han and E.S. Kim, "*Parylene-Diaphragm Piezoelectric Acoustic Transducers*," IEEE International Micro Electro Mechanical Systems Conference, Miyazaki, Japan, January 23-27, 2000, pp. 148-152.

[C26] M. Niu, H. Zeng, H. Yan and E.S. Kim, "*Extensive Experimental Study on Diaphragm-Based Piezoelectric Microphone*," International Mechanical Engineering Congress and

Exposition, Symposium on Microelectromechanical Systems (Nashville, TN), November 14-19, 1999, MEMS-Vol. 1, pp. 209-213.

[C25] C.-H. Han and E.S. Kim, "*Micromachined Piezoelectric Ultrasonic Transducers on Dome-Shaped-Diaphragm in Silicon Substrate*," IEEE International Ultrasonics Symposium (Lake Tahoe, NV), October 17-21, 1999, pp. 1167-1172.

[C24] H. Wang and E.S. Kim, "*Ejection Characteristics of Micromachined Acoustic-Wave Liquid Ejector*," Transducers '99, IEEE International Conference on Solid-State Sensors and Actuators (Sendai, Japan), June 7-10, 1999, pp. 1784-1787.

[C23] C.-H. Han and E.S. Kim, "*Fabrication of Dome-Shaped Diaphragm with Circular Clamped Boundary on Silicon Substrate*," IEEE International Micro Electro Mechanical Systems Conference, Orlando, FL, January 17-21, 1999, pp. 505-510.

[C22] H. Yan, K.C. Lou, B.C. Lee and E.S. Kim, "*Analysis on Multi-layered, Corrugated Diaphragm with Residual Stress*," ASME International Mechanical Engineering Congress and Exposition, Symposium on Microelectromechanical Systems (Anaheim, CA), November 15-20, 1998, DSC-Vol. 66, pp. 373-378.

[C21] C.-H. Han and E.S. Kim, "*Study of Self-Limiting Etching Behavior in Wet Isotropic Etching of Silicon*," International Microprocess and Nanotechnology Conference, Kyoungju, Korea, July 13-16, 1998.

[C20] H. Lakdawala and E.S. Kim, "*Simple Post-Processing Technique to Tune Resonant Frequency of Film Bulk Acoustic Resonators and Stacked Crystal Filters*," IEEE International Frequency Control Symposium (Pasadena, CA), May 27-29, 1998, pp. 831-835.

[C19] F. von Preissig, H. Zeng, and E.S. Kim, "*Test Methods for Characterizing Piezoelectric Thin Films*," MRS 1998 Spring Meeting (San Francisco, CA), April 13-17, 1998, Symposium Proceedings Vol. 518, pp. 117-122.

[C18] H. Keiner, F. von Preissig, H. Zeng, M. Nejhad and E.S. Kim, "*Advanced Bulge Test System*," MRS 1997 Fall Meeting (Boston, MA), December 1-5, 1997, Syposium Proceedings Vol. 505, pp. 229-234.

[C17] X. Zhu and E.S. Kim, "*Acoustic-Wave Liquid Mixer*," ASME International Mechanical Engineering Congress and Exposition, Symposium on Mechanics in Micro-Electro-Mechanical Systems (Dallas, TX), November 16-21, 1997, DSC-Vol. 62, pp. 35 - 38.

[C16] K.C. Lou, X. Zhu, H. Lakdawala and E.S. Kim, "*Study on Etch Front of Piezoelectric ZnO Film and New Step Coverage Technique*," IEEE International Ultrasonics Symposium (Toronto, Canada), October 5-8, 1997, pp. 565-568.

[C15] X. Zhu and E.S. Kim, "*Microfluidic Motion Generation with Loosely-Focused Acoustic Waves*," Transducers '97, IEEE International Conference on Solid-State Sensors and Actuators (Chicago, IL), June 16-19, 1997, pp. 837-838.

[C14] H. Yan and E.S. Kim, "*Corrugated Diaphragm for Piezoelectric Microphone*," the 5th IEEE International Conference on Emerging Technologies and Factory Automation, Kauai, HI, November 18-21, 1996, pp. 503-506.

[C13] F. von Preissig, H. Zeng and E.S. Kim, "*New Methods of Measuring Key Elastic-Piezoelectric Constant of Thin Films*," ASME Winter Annual Meeting, Symposium on Mechanics in Micro-Electro-Mechanical Systems (Atlanta, GA), November 17-22, 1996, DSC-Vol. 59, pp. 307-312.

[C12] W.W. Lau, Y. Song and E.S. Kim, "*Lateral-Field-Excitation Acoustic Resonators for Monolithic Oscillators and Filters*," IEEE International Frequency Control Symposium, Honolulu, HI, June 5 - 7, 1996, pp. 558-562.

[C11] Y.L. Huang, H. Zhang, E.S. Kim, S.G. Kim and Y.B. Jeon, "*Piezoelectrically Actuated Microcantilever for Actuated Mirror Array Application*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 2 - 6, 1996, pp. 191-195.

[C10] X. Zhu, E. Tran, W. Wang, E.S. Kim and S.Y. Lee, "*Micromachined Acoustic-Wave Liquid Ejector*," Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 2 - 6, 1996, pp. 280-282.

[C9] S.Y. Lee, Y.K. Kwong, E.S. Kim and E. Tran, "*Local Thermal Decoupling Using Silicon Micromachining*," The 1995 March Meeting of American Physical Society (San Jose, CA), March 20-24, 1995.

[C8] H. Zhang and E.S. Kim, "*Dome-Shaped Diaphragm Microtransducers*," MEMS '95, IEEE International Workshop on Micro Electro Mechanical Systems (Amsterdam, Netherlands), Jan. 29 - Feb. 2, 1995, pp. 256-260.

[C7] Y. Huang and E.S. Kim, "*Ultrasonic Agitation During Sputter Deposition of Thin Film*," ASME Winter Annual Meeting, Symposium on Mechanics of Materials Processing and Manufacturing (Chicago, IL), November 6-11, 1994, AMD-Vol. 194, pp. 13-18.

[C6] A.D. Sathe and E.S. Kim, "*Techniques to Control Residual Stress in ZnO Thin Films*," Transducers '93, IEEE International Conference on Solid-State Sensors and Actuators (Yokohama, Japan), June 7-10, 1993, pp. 158-161.

[C5] R.P. Ried, E.S. Kim, D.M. Hong and R.S. Muller, "*Residual-Stress Compensation in Clamped-Clamped Micromachined Plates*," ASME Winter Annual Meeting, Symposium on Micro-Mechanical Systems (Anaheim, CA), November 8-13, 1992, DSC-Vol. 40, pp. 23 - 32.

[C4] E.S. Kim, J.R. Kim and R.S. Muller, "*Improved IC-Compatible Piezoelectric Microphone and CMOS Process*," Transducers '91, IEEE International Conference on Solid-State Sensors and Actuators (San Francisco, CA), June 23-27, 1991, pp. 270-273.

[C3] E.S. Kim, R.S. Muller and P.R. Gray, "*Integrated Microphone with CMOS Circuits on A Single Chip*," IEEE International Electron Devices Meeting (Washington, D.C.), Dec. 3-6, 1989, pp. 880-883.

[C2] E.S. Kim and R.S. Muller, "*Piezoelectric Readout Miniature Microphone*," Proc. International Symposium on Microelectronics (Minneapolis, MN), Sept. 28-30, 1987, pp. 290-295.

[C1] E.S. Kim and R.S. Muller, "*Micromachined ZnO on Silicon Nitride Pressure Sensor*," IEEE International Electron Devices Meeting (Los Angeles, CA), Dec. 7-10, 1986, pp. 807-808.

Recent New Course Development:

Proposed and developed a new 4-unit graduate-level course on Wearable Technology at USC.

- Taught the course in Fall 2021, up to which point there had been no formal course on wearable technology in the nation, nor any good textbook on it. Developed a total of 592 PowerPoint Slides along with 5 homework problem sets to teach, for the first time, wearable technology with focus on sensing, signal processing (analog and digital), RF communication, power sources, power management, energy harvesting, flexible substrate technology, and wearable algorithms; with the following weekly topics.

Week	Topic
1	Introduction to Wearable Technology (25 Slides)
2 – 4	Wearable Sensors for Acceleration, Angular Velocity, Ambient Pressure, Audio, Magnetic Field, Light, Infrared Imaging, Vapors, etc. (112 Slides)
5 - 6	Sensing Technologies (Capacitive, Piezoresistive, Piezoelectric, etc.), Flexible and Stretchable Substrate Technology, Lab on Skin, RF Communication, etc. (103 Slides)
7	Batteries, Energy Harvesting, and Power Management for Wearable Technology (41 Slides)
8 - 9	Wearable Hardware Platforms, Wearable Algorithms, Feature Extraction, Training and Classification, Minimum-Cost Action Coverage, Dimensionality Reduction, etc. (99 Slides)
10 - 12	Digital Signal Processing, Difference Equation, Convolution, Z Transform, DFT, FFT, Signal Modulation, Rules of Probability, Kalman Filter, Hidden Markov Model, etc. (136 Slides)
13 - 14	Wearable Technology for Healthcare: Heart Rate Sensing, Blood Oxygen Sensing, Electrocardiogram, Body Sensor Network, Algorithms to Mitigate Artifacts, etc. (76 Slides)