Mark G. Allen

Alfred Fitler Moore Professor of Electrical and Systems Engineering
Scientific Director, Singh Center for Nanotechnology
University of Pennsylvania

I. EARNED DEGREES

Degree	Year	University	Area
Ph.D.	1989	Massachusetts Institute of Technology	Chemical Eng/Microelectronics
S.M.	1986	Massachusetts Institute of Technology	Chemical Engineering
B.S.E.E.	1988	University of Pennsylvania	Electrical Engineering
B.S.Ch.E.	1984	University of Pennsylvania	Chemical Engineering
B.A.	1984	University of Pennsylvania	Chemistry

II. EMPLOYMENT

Position	Employer	Dates
Moore Professor	University of Pennsylvania	2013-present
Director, Singh Nanotech Center	University of Pennsylvania	2013-present
Executive Director	GT Institute for Electronics and Nanotechnology	2011-2013
Acting Director	GT Georgia Electronic Design Center	2010-2011
Senior Vice Provost, Research	Georgia Institute of Technology	2007-2010
Regents' Professor	Georgia Institute of Technology	2005-2013
Professor	Georgia Institute of Technology	1999-2013
Associate Professor (tenure)	Georgia Institute of Technology (GT)	1994-1999
Postdoctoral Associate	Massachusetts Institute of Technology	1989

III. SCHOLARLY PUBLICATIONS AND PRESENTATIONS

III.A. Published Books and Parts of Books

1. Allen, M.G. and Senturia, S.D., "Microfabricated Structures for the Measurement of Adhesion and Mechanical Properties of Polymer Films," in Adhesives, Sealants, and Coatings for Space and Other Harsh Environments, pp. 501-508, (L.H. Lee, ed.), Plenum Press, New York, 1988.
2. Allen, M.G., Nagarkar, P.V., and Senturia, S.D., "Aspects of Adhesion Measurement of Thin Polyimide Films," in Polyimides: Materials, Chemistry, and Characterization, pp. 705-717, (C. Feger, ed.) Elsevier Science Publishers, Amsterdam, 1989.
3. Allen, M.G., *Special Tests For Membranes and Miniature Components*, in the American Society for Materials International Handbook Volume 3: Adhesives and Sealants, ASM Press, Metals Park, Ohio, 1990.
4. Jardine, A.P., Johnson, G.C., Crowson, A., and Allen, M.G. (eds.), Smart Materials Fabrication and Materials for Microelectromechanical Systems, Materials Research Society Press, vol. 276, 1992.
5. Hodge, T.C., Kohl, P.A., Bidstrup, S.A., Lee, J.B. and Allen, M.G., "In-Situ Thermal Expansion Measurements of Interlevel Dielectric Polymer Films", in Polyimides: Trends in Materials and Applications, pp. 287 - 302 (C. Feger, Mahmoud M. Khojasteh, Steven E. Molis Eds.), Connecticut: Society of Plastic Engineers, 1996.
6. Arnold, D., and Allen, M.G., "Fabrication of Microscale Rotating Magnetic Machines," in Multi-Wafer Rotating MEMS Machines, (ed. Lang, J.H.), Springer, 2009.

III.B. Journal Publications

1. Hasan, T., Allen, M.G., and Cooperman, B.S., "Anhydrotetracycline is a Major Product of Tetracycline Photolysis," *Journal of Organic Chemistry*, vol. 50, no. 10, pp. 311-313 (1985)

2. Allen, M.G., Mehregany, M., Howe, R.T., and Senturia, S.D., "Microfabricated Structures for the In-Situ Measurement of Residual Stress, Young's Modulus, and Ultimate Strain of Thin Films," *Applied Physics Letters*, vol. 51, no. 4, pp. 241-244 (1987)
3. Allen, M.G. and Senturia, S.D., "Analysis of Critical Debonding Pressures of Stressed Thin Films in the Blister Test," *Journal of Adhesion*, vol. 25, pp. 303-315 (1988)
4. Allen, M.G. and Senturia, S.D., "Application of the Island Blister Test for Thin Film Adhesion Measurement," *Journal of Adhesion*, vol. 29, pp. 219-231 (1989)
5. Allen, M.G., Nikolich, A., Scheidl, M., and Smith, R.L., "Movable Micromachined Silicon Plates with Integrated Position Sensing," *Sensors and Actuators*, A21-A23, pp. 211-214 (1990)
6. Camperi-Ginestet, C., Hargis, M., Jokerst, N., and Allen, M.G., "Alignable Epitaxial Liftoff of Gallium Arsenide Materials with Selective Deposition Using Polyimide Diaphragms," *IEEE Photonics Technology Letters*, vol. 3, no. 12, pp. 1123-1125 (1991)
7. Kim, Y.W. and Allen, M.G., "Single and Multilayer Surface Micromachined Platforms Using Electroplated Sacrificial Layers," *Sensors and Actuators* , A35, pp. 61-68 (1992)
8. Camperi-Ginestet, C., Kim, Y.W., Jokerst, N., Allen, M.G., and Brooke, M., "Three Dimensional Integrated Circuits: Compound Semiconductor Detectors Integrated Directly On Top Of Integrated Circuits," *IEEE Photonics Technology Letters*, vol. 4, no. 9, pp. 1003-6 (1992)
9. Frazier, A.B. and Allen, M.G., "Piezoresistive Graphite/Polyimide Thin Films for Micromachining Applications," *Journal of Applied Physics* (73), pp. 4428-4433 (1993)
10. Ahn, C.H. and Allen, M.G., "A Planar Micromachined Spiral Inductor for Integrated Magnetic Microactuator Applications," *Journal of Micromechanics and Microengineering*, vol. 3, no. 2, pp. 37-44 (1993)
11. Ahn, C.H. and Allen, M.G., "A Fully Integrated Surface Micromachined Magnetic Microactuator with a Multilevel Meander Magnetic Core," *IEEE Journal of Microelectromechanical Systems*, vol. 2, no. 1, pp. 15-22 (1993)
12. Frazier, A.B. and Allen, M.G., "Metallic Microstructures Fabricated Using Photosensitive Polyimide Electroplating Molds," *IEEE Journal of Microelectromechanical Systems*, vol. 2, no. 2, pp. 87-94 (1993)
13. Ahn, C.H., Kim, Y.J., and Allen, M.G., "A Planar Variable Reluctance Magnetic Micromotor with Fully Integrated Stator and Coils," *IEEE Journal of Microelectromechanical Systems*, vol. 2, no. 4, pp. 165-73 (1993)
14. Ahn, C.H. and Allen, M.G., "New Toroidal-Meander-Type Integrated Inductor with a Multilevel Meander Magnetic Core," *IEEE Transactions on Magnetics*, vol. 30, no. 1, pp. 73-79 (1994)
15. Ahn, C.H., Kim, Y.J., and Allen, M.G., "A Fully Integrated Planar Toroidal Inductor with a Micromachined Nickel-Iron Magnetic Bar," *IEEE Transactions on Components, Packaging, and Manufacturing Technology, Part A*, vol. 17, no. 3, pp. 463-469 (1994)
16. Frazier, A.B., Olson, C.S, Turner, S.P., and Allen, M.G., "Characterization of Graphite-Filled Polyimide Thin Films Using Micromachining Techniques," *International Journal of Microcircuits and Electronic Packaging*, vol. 17, no. 1, pp. 37-49 (1994)
17. Wilkinson, S.T., Kim, Y.W., Jokerst, N.M., and Allen, M.G., "Integration of Thin Film Optoelectronic Devices onto Micromachined Movable Platforms," *IEEE Photonics Technology Letters*, v. 6, n. 9, p. 1115-18 (1994)
18. Frazier, A.B., Ahn, C.H., and Allen, M.G., "Development of Micromachined Devices using Polyimide-Based Processes," *Sensors and Actuators A (Physical)*, vol. A45, no. 1, pp. 47-55 (1994)
19. Lee, J.B., Chen, Z., Allen, M.G., Rohatgi, A., and Arya, R., "A Miniaturized High-Voltage Solar Cell Array as an Electrostatic MEMS Power Supply," *IEEE Journal of Microelectromechanical Systems*, vol. 4, no. 3, pp. 102-108 (1995)
20. Carter-Coman, C., Brown, A.S., Bicknell-Tassius, R., Jokerst, N.M., and Allen, M.G., "Strain-Modulated Epitaxy: A Flexible Approach to 3-D Band Structure Engineering Without Surface Patterning," *Applied Physics Letters*, vol. 69, no. 2 pp. 257-259 (1996)

21. Ahn, C.H. and Allen, M.G., "A Comparison of Two Micromachined Inductors (Bar- and Meander-Type) for Fully Integrated Boost DC/DC Power Converters," *IEEE Transactions on Power Electronics*, vol. 11, no. 2, pp. 239-245 (1996)
22. Lee, J.B., Allen, M.G., Hodge, T.C., Bidstrup, S.A., and Kohl, P.A., "Modeling of Substrate-Induced Anisotropy in Through-Plane Thermal Behavior of Polymeric Thin Films," *Journal of Polymer Science, Part B (Polymer Physics)*, vol. 34, no. 9, pp. 1591-6 (1996)
23. Nami, Z., Ahn, C.H., and Allen, M.G., "An Energy-Based Design Criterion for Magnetic Microactuators," *Journal of Micromechanics and Microengineering*, vol. 6, no. 3, pp. 337-44 (1996)
24. Ahn, C.H., Allen, M.G., Trimmer, W., Jun, Y.-N., and Erramilli, S., "A Fully Integrated Micromachined Magnetic Particle Separator," *IEEE Journal of Microelectromechanical Systems*, v. 5, n. 3, pp. 151-8 (1996)
25. Lee, J.B., English, J., Ahn, C.-H., and Allen, M.G., "Planarization Techniques for Vertically Integrated Metallic MEMS on Silicon Foundry Circuits," *Journal of Micromechanics and Microengineering*, vol. 7, no. 2, pp. 44-54 (1997)
26. Lagorce, L.K. and Allen, M.G., "Magnetic and Mechanical Properties of Micromachined Strontium Ferrite/Polyimide Composites," *IEEE Journal of Microelectromechanical Systems*, v. 6, n. 4, pp. 307-12 (1997)
27. Frazier, A.B. and Allen, M.G., "Uses of Electroplated Aluminum for the Development of Microstructures and Micromachining Processes," *IEEE Journal of Microelectromechanical Systems*, vol. 6, no. 2, pp. 91-98 (1997)
28. Park, J.Y., Lagorce, L.K., and Allen, M.G., "Ferrite-Based Integrated Planar Inductors and Transformers Fabricated at Low Temperature," *IEEE Transactions on Magnetics*, vol. 33, no. 5, pt. 1, pp. 3322-3324 (1997)
29. Taylor, W.P., Brand, O., and Allen, M.G., "Fully Integrated Magnetically Actuated Micromachined Relays," *IEEE Journal of Microelectromechanical Systems*, vol. 7, no. 2, pp. 181-191 (1998)
30. Kim, Y.J., and Allen, M.G., "Surface Micromachined Solenoid Inductors for High Frequency Applications," *IEEE Transactions on Components, Packaging & Manufacturing Technology, Part C (Manufacturing)*, vol. 21, no. 1, pp. 26-33 (1998)
31. Chahal, P., Tummala, R.R., Allen, M.G., and Swaminathan, M., "A Novel Integrated Decoupling Capacitor for MCM-L Technology," *IEEE Transactions on Components, Packaging and Manufacturing Technology, Part B: Advanced Packaging*, vol. 21, no. 2, pp. 184-193 (1998)
32. Henry, S., McAllister, D.V., Allen, M.G., and Prausnitz, M.R., "Microfabricated Microneedles: A Novel Approach to Transdermal Drug Delivery," *Journal of Pharmaceutical Sciences*, v. 87, no. 8, pp. 922-5 (1998)
33. Park, J.Y. and Allen, M.G., "Development of Magnetic Materials and Processing Techniques Applicable to Integrated Micromagnetic Devices," *Journal of Micromechanics and Microengineering*,, vol. 8, no. 4, pp. 307-316 (1998)
34. Taylor, W.P., Brand, O., and Allen, M.G., "Fully Integrated Magnetically Actuated Micromachined Relays," *IEEE Journal of Microelectromechanical Systems*, vol. 7, no. 2, pp. 181-191 (1998)
35. Chahal, P., Tummala, R.R., Allen, M.G., and Swaminathan, M., "A Novel Integrated Decoupling Capacitor for MCM-L Technology," *IEEE Transactions on Components, Packaging and Manufacturing Technology*, Part B: Advanced Packaging, vol. 21, no. 2, pp. 184-193 (1998)
36. Park, J.Y. and Allen, M.G., "Packaging-Compatible Microinductors and Microtransformers with Screen-Printed Ferrite using Low Temperature Processes," *IEEE Transactions on Magnetics*, vol. 34, no. 4, pt. 1, p.1366-8 (1998)
37. Ahn, C.H. and Allen, M.G. "Micromachined Planar Inductors on Silicon Wafers for MEMS Applications," *IEEE Transactions on Industrial Electronics*, vol.45, no.6, p.866-76 (1998)
38. Lagorce, L., Brand, O., and Allen, M.G., "Magnetic Microactuators Based on Polymer Magnets," *IEEE Journal of Microelectromechanical Systems*, vol.8, no.1, pp. 2-9 (1999)
39. Park, J.Y.; Allen, M.G., "Packaging-compatible high Q microinductors and microfilters for wireless applications," *IEEE Transactions on Advanced Packaging*, vol.22, no.2, pp. 207-13 (1999)

40. Kim, Y.J.; Allen, M.G., "In situ measurement of mechanical properties of polyimide films using micromachined resonant string structures," *IEEE Transactions on Components and Packaging Technologies*, vol.22, no.2, pp. 282-90 (1999)
41. Park, J.Y.; Han, S.H.; Allen, M.G., "Batch-fabricated microinductors with electroplated magnetically anisotropic and laminated alloy cores," *IEEE Transactions on Magnetics*, vol.35, no.5, pt.3, p.4291-4300 (1999)
42. Taylor, W.P.; Schneider, M.; Baltes, H.; Allen, M.G., "A NiFeMo electroplating bath for micromachined structures," *Electrochemical and Solid-State Letters*, vol.2, no.12, pp. 624-6 (1999)
43. Park, J.Y.; Allen, M.G., "High Q spiral-type microinductors on silicon substrates," *IEEE Transactions on Magnetics*, vol.35, no.5, pt.2, pp. 3544-6 (1999)
44. Bhattacharya, S.K.; Park, J.Y.; Tummala, R.R.; and Allen, M.G., "Fabrication of a Fully Integrated Passive Module for Filter Application using MCM-D Compatible processes," *J. Materials Science: Materials in Electronics*, vol. 11, no. 6, pp. 455-60 (2000)
45. Park, J.Y., and Allen, M.G., "Integrated Electroplated Micromachined magnetic Devices using Low Temperature Fabrication Processes," *IEEE Transactions on Electronics Packaging Manufacturing*, vol. 23, no. 1, pp. 48-55 (2000)
46. Seriburi, P.; Kercher, D.; Allen, M.G., "An Experimental Study of Microfabricated Spark Gaps: Wear and Erosion Characteristics," *J. Micromechanics Microengineering*, vol. 11, no. 3, pp. 165-74 (2001)
47. Park, J.W.; Park, J.Y.; Joung, Y.H.; Allen, M.G., "Fabrication of High Current and Low Profile Micromachined Inductor with Laminated Ni/Fe Core," *IEEE Transactions on Components and Packaging Technologies*, vol. 25, no. 1, pp. 106-111 (2002)
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49. Chang, S.P.; Lee, J.B.; Allen, M.G., "A Robust Capacitive Pressure Sensor Array," *Sensors and Actuators A (Physical),* vol. A101, no. 1-2, pp. 231-8 (2002)
50. Dongsu Kim; Yoonsu Choi; Allen, M.G.; Kenney, J.S.; Kiesling, D., "A wide-band reflection-type phase shifter at S-band using BST coated substrate" *IEEE Transactions on Microwave Theory and Techniques* , v 50, n 12, pp. 2903-9 (2002)
51. Allen, M.G., "MEMS technology for the fabrication of RF magnetic components" *IEEE Transactions on Magnetics*, v 39, n 5, pt.2, pp. 3073-8 (2003)
52. Yoon, Y.K.; Kim D.; Allen, M.G.; Kenney, J.S.; Hunt, A.T., "A reduced intermodulation distortion tunable ferroelectric capacitor-architecture and demonstration" *IEEE Transactions on Microwave Theory and Techniques* , v 51, n 12, pp. 2568-76 (2003)
53. Kim, D; Choi, Y.; Ahn, M.; Allen, M.G.; Kenney, J.S., "Monolithic 180 degrees and 360 degrees analog phase shifters based on barium strontium titanate coated sapphire substrates; *IEICE Transactions on Electronics* , v E86-C, n 8, pp. 1607-12 (2003)
54. Kaiser, T.J.; Allen, M.G., "A pendulous oscillating gyroscopic accelerometer fabricated using deep-reactive ion etching" *IEEE Journal of Microelectromechanical Systems* , v 12, n 1, pp. 21-8 (2003)
55. Park, J.W.; Allen, M.G., "Ultralow-profile micromachined power inductors with highly laminated Ni/Fe cores: application to low-megahertz DC-DC converters" *IEEE Transactions on Magnetics* , v 39, n 5, pt.2, p 3184-6 (2003)
56. Kim, D.; Choi, Y.; Ahn, M.; Allen, M.G.; Kenney, J.S.; Marry, P. "2.4 GHz continuously variable ferroelectric phase shifters using all-pass networks" *IEEE Microwave and Wireless Components Letters*, v 13, n 10, pp. 434-436 (2003)
57. Kercher, D.S.; Lee, J.B.; Brand, O.; Allen, M.G.; Glezer, A., "Microjet cooling devices for thermal management of electronics" *IEEE Transactions on Components and Packaging Technologies* , v 26, n 2, p 359-66 (2003)

58. Chang, S.P.; Allen, M.G., "Capacitive pressure sensors with stainless steel diaphragm and substrate" *Journal of Micromechanics and Microengineering* , v 14, n 4, pp. 612-18 (2004)
59. Park, J.W.; Cros, F.; Allen, M.G, "Planar spiral inductors with multilayer micrometer-scale laminated cores for compact-packaging power converter applications" *IEEE Transactions on Magnetics* , v 40, n 4, pt. 2, p. 2020-2 (2004)
60. DiBiaso, H.H.; English, B.A.; Allen, M.G,. "Solid-phase conductive fuels for chemical microactuators" *Sensors and Actuators A (Physical)* , v. A111, n 2-3, p 260-6 (2004)
61. Arnold, D.P.; Zana, I.; Cros, F.; Allen, M.G., "Vertically laminated magnetic cores by electroplating Ni-Fe into micromachined Si" *IEEE Transactions on Magnetics* , v 40, n 4, pt.2, pp. 3060-2 (2004)
62. Davis, S.P.; Landis, B.J.; Adams, Z.H.; Allen, M.G.; Prausnitz, M.R, "Insertion of microneedles into skin: measurement and prediction of insertion force and needle fracture force" *Journal of Biomechanics* , v 37, n 8, pp. 1155-63 (2004)
63. Arnold, D.P; Cros, F.; Zana, I.; Veazie, D.R.; Allen, M.G., "Electroplated metal microstructures embedded in fusion-bonded silicon: conductors and magnetic materials," *IEEE Journal of Microelectromechanical Systems* , v 13, n 5, pp. 791-8 (2004)
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65. Chang, S.P., and Allen, M.G., "Demonstration for Integrating Capacitive Pressure Sensors with Readout Circuitry on Stainless Steel Substrates," *Sensors and Actuators A (Physical)*, vol. A116, no. 2, p. 195-204 (2004)
66. Courcimault, C., Allen, M.G., "Reconfigurable shadow mask technology: A microsystem for metal nanoline deposition", *Nanotechnology*, vol. 15, no. 10, page S528-S533 (2004)
67. Park, J.-H.; Allen, M.G.; and Prausnitz, M.R., "Biodegradable polymer microneedles: fabrication, mechanics and transdermal drug delivery," *Journal of Controlled Release* 104:51-66 (2005)
68. Yoon, Y.K., and Allen, M.G., "Embedded Conductor Technology for Micromachined RF Elements," *Journal of Micromechanics and Microengineering*, v 15, n 6, p 462-70 (2005)
69. Arnold, D.P., Zana, I., and Allen, M.G., "Analysis and Optimization of Vertically Oriented, Through-Wafer, Laminated Magnetic Cores in Silicon," *Journal of Micromechanics and Microengineering*, v 15, n 5, p 971-7 (2005)
70. Chung, C., and Allen, M.G., "Uncrosslinked SU-8 as a Sacrificial Material," *Journal of Micromechanics and Microengineering*, v 15, n 1, p N1-5 (2005)
71. Davis, S.P., Martanto, W., Allen, M.G., and Prausnitz, M.R., "Hollow Metal Microneedles for Insulin Delivery to Diabetic Rats," *IEEE Transactions on Biomedical Engineering*, v. 52, no. 5, p. 909-15 (2005)
72. Yong Wang, Guang Yuan, Yong-Kyu Yoon, Allen, M.G., Bidstrup, S.A. "Active cooling substrates for thermal management of microelectronics," *IEEE Transactions on Components and Packaging Technologies*, v 28, n 3, p. 477-83 (2005)
73. Yong-Kyu Yoon, Jin-Woo Park, Mark G. Allen, "Polymer-core conductor approaches for RF MEMS," *IEEE Journal of Microelectromechanical Systems,* v. 14, n. 5, p. 886-894 (2005)
74. Yong-Kyu Yoon, Kenney, J.S., Hunt, A.T., Allen, M.G. "Low-loss microelectrodes fabricated using reverse-side exposure for a tunable ferroelectric capacitor application," *Journal of Micromechanics and Microengineering*, v 16, n 2, p 225-34 (2006)
75. Arnold, D. P., Das, S., Cros, F., Zana, I., Lang, J. H., and Allen, M. G., "Magnetic induction machines integrated into bulk-micromachined silicon," *IEEE Journal of Microelectromechanical Systems*, vol. 16, no. 2, pp. 406- 414, (2006)
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77. Bidstrup, S.A., Y. Wang, G Yuan, Y.-K. Yoon, Allen, M.G., "Large eddy simulation (LES) for synthetic jet thermal management," *International Journal of Heat and Mass Transfer*, v 49, n 13-14, p 2173-9 (2006)
78. Arnold, D. P., Herrault F., Zana I., Galle P., Park J.-W., Das, S., Lang, J. H., and Allen, M. G., " Design optimization of an 8 W, microscale, axial-flux, permanent-magnet generator," *Journal of Micromechanics and Microengineering*, v 16, n 9, p. 290-6 (2006)
79. Chung, C.C., Allen, M.G. "Thermomigration-based junction isolation of bulk silicon MEMS devices," *IEEE Journal of Microelectromechanical Systems*, v 15, n 5, p 1131-8 (2006)
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83. Arnold, D.P.; Das, S.; Jin-Woo Park; Zana, I.; Lang, J.H.; Allen, M.G., "Microfabricated high-speed axial-flux multiwatt permanent-magnet generators-part II: design, fabrication, and testing," *IEEE Journal of Microelectromechanical Systems*, v 15, n 5, p 1351-63 (2006)
84. Coe, D.J., Allen, M.G., Rinehart, C.S., Glezer, A., "Pneumatically actuated micromachined synthetic jet modulators," *Sensors and Actuators A (Physical),* v 132, n 2, p 689-700 (2006)
85. Y. Wang, G. Yuan, Y.-K. Yoon, Allen, M. G., Bidstrup, S. A., "Optimization of synthetic jet fluidic structures in printed wiring boards," *Transactions of the ASME. Journal of Electronic Packaging*, v 128, n 4, p 353-9 (2006)
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88. J.H. Park, S.O. Choi, R. Kamath, J.K Yoon, M.G. Allen, and M.R. Prausnitz, "Polymer particle-based micromolding to fabricate novel microstructures," *Biomedical Microdevices*, v 9, n 2, p. 223-234 (2007)
89. Y. Choi, M. McClain, M. LaPlaca, A. Frazier, and M.G. Allen, "Three-dimensional microfluidic perfusion system for thick brain slice cultures," *Biomedical Microdevices*, v 9, n 1, p. 7-13 (2007)
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91. Y.H. Joung and M.G. Allen, "Chip-to-board micromachining for interconnect layer passive components," *IEEE Transactions on Components and Packaging Technologies*, v 30, n 1, p 15-23 (2007)
92. Y. Choi, B. Wester, and M.G. Allen, "Mechanically driven microtweezers with integrated microelectrodes," *Journal of Micromechanics and Microengineering*, v 18, n 6, p 065004 (2008)
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94. Y.H. Joung and M.G. Allen, "A micromachined chip-to-board interconnect system using electroplating bonding technology," *IEEE Transactions on Advanced Packaging*, v 31, n. 2, p. 357-66 (2008)
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IV. HONORS AND AWARDS

1. Member, Tau Beta Pi (Engineering Honor Society), 1984
2. Member, Phi Lambda Upsilon (Chemistry Honor Society), 1984
3. Arthur K. Doolittle Award, American Chemical Society Division of Polymeric Materials: Science and Engineering, 1988
4. Georgia Tech College of Engineering Faculty Research Award, 2000
5. School of Electrical and Computer Engineering Sustained Program Development Award, 2002
6. J.M. Pettit Professorship in Microelectronics, Georgia Institute of Technology, 2005
7. Named as Regents' Professor, University System of Georgia, 2005.
8. Outstanding Leadership Award for Development of Graduate Research Assistants (for the period 2001-2003), Georgia Institute of Technology, 2005
9. AeA Spirit of Endeavor Award, 2007
10. Named as IEEE Fellow, 2011
11. Alfred Fitler Moore Professorship, University of Pennsylvania, 2013
12. Georgia Research Alliance Catalyst Award, 2014
13. IEEE Daniel P. Noble Award, 2016
14. Fellow, National Academy of Inventors, 2017
15. IEEE Benjamin Franklin Key Award, 2020
16. Elected to National Academy of Engineering, 2023