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**EDUCATION:**

1981                      PhD Applied Physics,  
University of Cincinnati, Cincinnati, OH 45221

1978                      MS Physics,  
University of Cincinnati, Cincinnati, OH 45221

1976                      B. Sc. (Special) Physics,  
University of the West Indies, Jamaica, W.I.

**EXPERIENCE:**

2013-present            Professor, Dept. of Metallurgical and Materials Engineering,  
University of Alabama, Tuscaloosa, AL 35487-0202

2004 –2013            Associate Professor, Dept. of Metallurgical and Materials Engineering,  
University of Alabama, Tuscaloosa, AL 35487-0202.

2000 – 2004            Director of Technology, KDF, Rockleigh, NJ 07647

1997 – present        **Manager, PVD Process Development, Veeco Instruments,**  
**Orangeburg, NY 10962**

1990 – 1997            **Manager, Process Development, Magnetics and Media Division,**  
**Materials Research Corporation, Orangeburg, NY 10962.**

1988-1990            **Manager, Thin Films Lab, Advanced Materials Division**  
**Materials Research Corporation, Orangeburg, NY 10962.**

1985-1988            **Senior Scientist, Corporate Development**  
**Materials Research Corporation, Orangeburg, NY 10962.**

1981-1985

Senior Research Engineer, Westinghouse R&D Center

1310 Beulah Road, Pittsburgh, PA 15235.

**AWARDS:**

1. Sony Outstanding Technical Achievement Award (1991): "Development of High Productivity Processes for MiniDisc Coating Applications".
2. Class 1 NASA Tech. Brief Award (1985): "Selective Electroplating on Laser-Irradiated Surfaces".
3. One of 100 top innovations of 1984-85 selected by Science Digest magazine: "Fabrication of MOSFETS in Laser-Recrystallized Silicon-on-Garnet".

**SUMMARY OF EXPERIENCE:**

Data Storage	Media	Optical Devices/Displays	Semiconductors
<b>Magnetic Tunnel Junctions</b>	<b>MO disks</b>	<b>Dielectric mirrors</b>	<b>MRAM</b>
<b>Giant Magnetoresistance</b>	<b>MiniDiscs™</b>	<b>Optical filters</b>	<b>Planarized aluminum/BSQ</b>
<b>AMR Read Heads</b>	<b>Hard disks</b>	<b>Optical waveguides</b>	<b>Backside metallization</b>
<b>Inductive Write Heads</b>		<b>Organic LEDs</b>	<b>Laser processing</b>

**University of Alabama (2004-present):**

**Research:**

Materials and devices for advanced spintronics and data storage applications: 1) DMREF: A rational design of half-metallic materials for spintronic applications (NSF DMR , September 2012-August 2016); 2) spin-torque transfer random access memory (Universal Memory Contract Grandis Inc-DARPA funded October 2008-October 2012); 3) advanced reader designs and novel barrier materials for magnetic tunnel junctions for advanced read heads (INSIC-EHDR funded in 2008-2009 and 2009-2010); 4) spin logic applications (NSF-NRI supplement to the MRSEC August 2009-June 2012); 5) nanopatterned graded media (NSF-GOALI funded September 2009-August 2013); 6) giant magnetoresistive nanolaminates for novel sensors (NSF-Sensors funded August 2005-August 2010).

**Students graduated:**

Name	Degree	Conferred	Title
Jinmei Dong	M.S. (MTE)	May 2006	Stress and Magnetic Properties of Laminated FeCo High Moment Thin Films for Write Heads
Rajeshchandra Thunuguntla	M. S. (MTE)	August 2006	Effect of Dendrimer Mediation and Rapid Thermal Annealing on Indium-Tin Oxide Thin Films
Zeenath Reddy Tadisina	M. S. (MTE)	December 2007	Effect of Pinning Schemes on the Magnetic and Transport

			Characteristics of Giant Magnetoresistive Spin Valves
Zeenath Reddy Tadisina	Ph.D. (MTE)	May 2010	Perpendicular Magnetic Anisotropy Materials for Reduced Current Switching Devices
Anusha Natarajarathinam	Ph.D. (ECE)	August 2012	Exploration of Perpendicular Anisotropy Material Systems for Application in Spin Transfer Torque-Random Access Memory
Hao Su	Ph.D. (Materials Science)	May 2014	Nanostructured Magnetic Recording Media by Patterning and Glancing Angle Deposition
<b>Name</b>	<b>Degree</b>	<b>Conferred</b>	<b>Title</b>
Amritpal Singh	Ph. D. (Physics)	August 2014	Multi-layer magnetism and thermal stability in p-MTJ's
Joseph Abugri	M.S. (ECE)	May 2015	Non-thesis

### Teaching:

MTE-271: Introduction to Materials Engineering (16 sections since Spring 2006, including distance learning course)

MTE-275: Introduction to Materials Lab: introduced new labs and entered students into Undergraduate Research and Creativity Conference in both years lab was taught.

MTE-252: Metallurgical Process Calculations.

MTE-450/550: Plasma Processing of Thin Films: Basics and Applications. Coordinated new elective course on fundamentals and applications of plasma processing of thin films, cross-listed undergraduate/graduate as well as MTE/ECE.

MTE-684: Coordinated new elective graduate course on solid state engineering, cross-listed with ECE.

MTE-596: Seminar coordinator for several semesters: introduced regular seminars by outside speakers as well as internal research groups.

MTE 491: Interim lab course on microfabrication (was taught first time in Interim 2010).

MTE 491 Introduction to Electronic Materials

### Service:

Faculty Director, UA Micro-Fabrication Facility: Transformed facility built on federally funded grant (after grant expiration) to university user facility in 2006, servicing over a dozen independent research groups in Engineering and Arts and Sciences. This facility has served significantly in outreach, training dozens of undergraduates in photolithography, at least half of whom have been women and minorities. In fact, the undergraduates have become the backbone of the facility, organizing and running it and training other students and researchers with minimal supervision from faculty. We have had Research Experiences for Undergraduates in the facility nearly every summer since it opened in 2007, with undergraduates conducting experiments on GMR sensors and advanced media. We have also hosted several high school students during summer high school internships. We have successfully transferred the facility from its original location in H. M. Comer to Beville to the MINT clean room and an additional lab. We plan to transfer it again next year to the new Materials Engineering Research Center.

Graduate Coordinator: Summer 2005 to Fall 2008.

Chair, Graduate Subcommittee, same period.

Member, University Graduate Research Committee, Fall 2007-2009.

Senior member, IEEE; Member, APS, TMS, AVS, MRS.

Program Chair/ Chair-Elect: 2008-2010; Chair:2010-2011 Thin Film Division, AVS.

PhD Committees Served On

Name	Degree	Conferred	Title	Dissertation Chair
Bo Ning	Ph.D. (Metallurgical Engineering)	2005	Microstructures and Properties of Hafnium Containing NiAl-Based Overlay Coatings	Mark Weaver
Harish Babu Bhandari	Ph.D. (Chemical and Biological Engineering)	2006	Characterization of hafnium based high-k thin films for solid state transistor gate application deposited by CVD and PECVD using hafnium (IV) ter-butoxide	Tonya Klein
Xiao Li	Ph.D. (Materials Science)	2007	Modification of Structures and Mechanical Properties of Metal Thin Films by Mediation with Self-Assembled Dendrimer Monolayers	Mark Weaver
Jian Zhong	Ph.D. (Materials Science)	2008	Piezoelectric and ferroelectric properties of CSD-prepared PZT films and their applications	Raghvendra Pandey
Vaibhav Nikam	Ph.D. (Metallurgical and Materials Engineering)	2008	Fundamental studies of materials, designs and models development for polymer electrolyte membrane fuel cell flow field distributors	Ramana Reddy
Jinwen Wang	Ph.D. (Chemical and Biological Engineering)	2008	A comparison of chromium oxide thin film deposition techniques for spin electronics	Tonya Klein/ Arunava Gupta
Yuhao Lu	Ph.D (Metallurgical and Materials Engineering)	2009	Designing, manufacturing, testing and optimizing of micro-fuel cells	Ramana Reddy
Debabrata Pradhan	Ph.D. (Metallurgical and Materials Engineering)	2010	Fundamental Studies on Electrochemical Production of Dendrite-Free Aluminum and Titanium-Aluminum Alloys	Ramana Reddy
Ning Li	Ph.D (Chemical and Biological Engineering)	2011	Chemical vapor deposition of thin film materials for electronic and magnetic applications	Tonya Klein
Ru Zhu	Ph.D. (Physics and Astronomy)	2011	Theoretical investigation of new magnetic recording media using an energy landscape method	Pieter Visscher
Tianyi Xu	Ph.D. (Physics and Astronomy)	2012	Theory based design and optimization of materials for spintronics applications	William Butler
Joel Alfano	Ph.D. (Metallurgical and Materials Engineering)	2013	<b>Microstructural Evolution and Oxidation Behavior of AlNiCrCoSi Multi-Component Alloys</b>	Mark Weaver

<b>Name</b>	<b>Degree</b>	<b>Conferred</b>	<b>Title</b>	<b>Dissertation Chair</b>
Jaejin Lee	Ph.D. (Electrical and Computer Engineering)	2014		Yang-Ki Hong
Joel Alfano	Ph.D. (Metallurgical and Materials Engineering)	2014		Mark Weaver
Chaolong Tang	Ph.D. (Metallurgical and Materials Engineering)			Jinhui Song
Haoxing Yang	Ph.D. (Metallurgical and Materials Engineering)			Ramana Reddy
Jihoon Park	Ph.D. (Electrical and Computer Engineering)			Yang-Ki Hong
Woncheol Lee	Ph.D. (Electrical and Computer Engineering)			Yang-Ki Hong
James Pepper	Ph.D. (Physics and Astronomy)			Dawn Williams
Ali Amiri	Ph.D. (Materials Science)			Arunava Gupta
Nariman Naghibolashrafi	Ph.D. (Materials Science)			William Butler
Ali Amiri	Ph.D. (Materials Science)			Arunava Gupta

**KDF (2000 – 2004):**

Responsible for all research and development for KDF sputtering tools that are utilized for semiconductor, display, MEMs, hybrids and medical applications. Developed high rate dielectric deposition processes for semiconductors and optical devices. Developed high quality indium-tin oxide films for displays and digital X-ray readers. Responsible for training and teaching engineers and technicians about the physics and technology of plasma processing. Responsible for development of intellectual property for KDF.

**Veeco Instruments/Materials Research Corporation(1985-2000):**

Originated and managed process development department for Magnetics and Media Division since its formation by Sony after buyout of MRC in 1989. Set up Class 1000 (operated at Class 100) cleanroom facility for magnetic and optical thin film deposition and measurement. Developed sputtering processes and cathodes for magneto-optics, optics, magnetic recording and semiconductor applications. Specialized in development of production processes for reactive magnetron sputtering of dielectrics and magnetron sputtering of magnetic materials. Won Sony Outstanding Technical Achievement Award in 1991 for development of high rate production processes and cathodes applied to the production of magneto-optical disks and MiniDiscs™. Participated in the development and installation of the first MiniDisc™ sputtering tools for Sony. Participated in the development, installation, and customer support of over ten customized production sputter tools in the U.S. and Japan. Created processes on in-line and cluster tools for a variety of other applications, including thin-film heads, hard disks, displays, thin-film resistors, and backside metallization of semiconductors.

Continued managing data storage applications at Veeco Instruments after division buyout in 1997. Significant achievements at Veeco included development that resulted in the highest density production GMR head reported in 1999, development of a high rate reactive alumina process for which a patent is pending, oxides for tunnel junctions, and laminated high moment films. Collaborated with University of Delaware on research for tunnel junctions and with Stevens Institute of Technology on development of DC reactive processes for insulators.

Managed Advanced Materials Division Thin Films Lab from 1988-1990. Performed target life tests for a variety of materials and cathodes. Developed high temperature superconductor targets and processes for deposition of superconducting films. Supervised two graduate students from Rutgers University on their PhD projects involving high  $T_c$  superconductors.

Worked as a senior scientist in the Corporate Development group from 1985 to 1988. Worked on developing a variety of sputtering processes for semiconductor applications, including bias sputtered quartz and aluminum planarization. Developed high temperature superconductor sputtering targets and transferred fabrication processes to production.

Formed part of MRC's Sputter School core faculty and taught on a variety of topics relating to thin-film and materials technology every year, both domestically and internationally. The Sputter School was initiated by MRC to educate newcomers to the industry on the art of deposition technology. Participated in a series of lectures at Brooklyn Polytechnic Institute for an external graduate course in Thin Film Technology. Presented a graduate seminar at Rutgers University on materials and thin-film development for data storage and media applications.

**Westinghouse R&D Center (1981-1985):**

Was a senior research engineer, working on a variety of laser processing applications for semiconductors and solar cells. Was the principal investigator for a JPL contract on laser metallization of solar cells. Developed processes for laser recrystallization of polysilicon on insulators (SOI) for semiconductor applications, and polysilicon on garnet for bubble memory applications (jointly with M.H. Kryder of Carnegie-Mellon University). Studied laser-assisted solid phase epitaxial growth of silicon on insulators using lateral seeding techniques. Used back side laser annealing to relieve stresses and improve interfacial defects in MIS devices. Used Raman scattering to investigate stresses at silicon-on sapphire (SOS) interfaces, as well as surface stresses in high-dose hydrogen-implanted silicon. Authored two Government technical proposals. Was active in collaborative research and proposal writing with professors and students from Carnegie-Mellon University and Penn State University.

**University of Cincinnati (1976-1981):**

Pursued an interdisciplinary Ph.D. thesis in integrated optics jointly with the Physics and Electrical Engineering departments. Developed CO<sub>2</sub> laser annealing as an effective technique to dramatically reduce scattering losses in a variety of thin-film optical waveguides on silicon substrates. Developed the lowest loss waveguide reported to date.

## INVENTIONS:

1. "Laser Annealing of MIS Devices by Back Surface Laser Treatment," S. Dutta and P. Rai-Choudhury, U.S. Patent No. 4,456,490 issued June 26, 1984.
2. "Selective Electroplating on Laser-Irradiated Surfaces," S. Dutta and P. A. Palaschak, Westinghouse Industrial Secret, 1985.
3. "Process Equipment With Simultaneous Or Sequential Deposition and Etching Capabilities", T. Yasar, I. Reiss, S. Gupta, R. S. Krishnaswamy and I. Wagner, U. S. Patent No. 5,958,134 issued September 28, 1999.
4. "Stable High Rate Reactive Sputtering", W. Xiong and S. Gupta, U. S. Patent No. 6,537,428 issued March 25, 2003.
5. "Linear Sweeping Magnetron in Scanning Batch Tool", S. Gupta and A. Ruspini, U. S. Patent No. 7,101,466 issued September 5, 2006.

## REFEREED JOURNAL PUBLICATIONS:

1. "Modeling interface exchange coupling: Effect on switching of granular FePt films," J. Abugri, P. Visscher, H. Su and S. Gupta, *J. Appl. Phys.* 118, 043902 (2015); <http://dx.doi.org/10.1063/1.4927216>
2. "(111) Orientation preferred L10 FePtB patterned by block copolymer templating", H. Su, S. C. Schwarm, R. L. Douglas, A. Montgomery, A. G. Owen and S. Gupta, *J. Appl. Phys.* 116, 113906 (2014).
3. "Microstructure Evolution and Magnetic Properties of FeB/PT Multilayers and FeBPT Composite films", H. Su, S. C. Schwarm, R. L. Martens and S. Gupta, *J. Appl. Phys.* 115, 17B717 (2014)
4. "Effect of interlayer exchange coupling parameter on switching time and critical current density in the composite free layer", A. Singh, S. Gupta, M. Kuteifan, M. Lubarda, V. Lomakin, and O. Mryasov, *J. Appl. Phys.* 116, 17D111 (2014)
5. Interlayer exchange coupled composite free layer for CoFeB/MgO based p-MTJs", A. Singh, S. Schwarm, O. N. Mryasov, and S. Gupta, *J. Appl. Phys.* **114**, 203901 (2013)
6. "Nanorods of Co/Pd multilayers fabricated by glancing angle deposition for advanced media," Hao Su, Anusha Natarajarathinam and Subhadra Gupta, *J. Appl. Phys.* **113**, 203901(2013)
7. "Micro Magnetic Exchange Interaction Tensor and Magnetization Reversal of L10 FePt Based Alloy Thin Film Nano-Structures", Amritpal Singh, Oleg Mryasov, Subhadra Gupta, Sergey Okatov, Kaizhong Gao and Erol Girt, *IEEE Trans. Magn.* **49**, 7 (2013).
8. "Influence of annealing on tunneling magnetoresistance of perpendicular magnetic tunnel junctions," A. Natarajarathinam, B. D. Clark, A. Singh, and S. Gupta, *J. Phys. D: Appl. Phys.* **46**, 095002 (2013).
9. "Influence of capping layers on CoFeB anisotropy and damping," A. Natarajarathinam, Z. R. Tadisina, T. Mewes, S. Watts, E. Chen and S. Gupta, *J. Appl. Phys.* **112**, 053909 (2012).
10. "Micromagnetic exchange interaction tensor and magnetization reversal of hcp Co based alloy thin film nano-structures," Amritpal Singh, Oleg Mryasov, Subhadra Gupta, Xiaobin Wang, and Erol Girt, (in press) *IEEE Trans. Magn.* (2012)
11. "Perpendicular magnetic tunnel junctions based on thin CoFeB free layer and Co-based multilayer synthetic antiferromagnet pinned layers, A. Natarajarathinam, R. Zhu, P. B. Visscher and S. Gupta, *J. Appl. Phys.*, **111**, 07C918 (2012)
12. "Perpendicular magnetic tunnel junctions using Co-based multilayers", Z.R. Tadisina, A.

- Natarajathinam, B. D. Clark, A. L. Highsmith, T. Mewes, S. Gupta, E. Chen and S. Wang, *J. Appl. Phys.*, **107**, 09C703 (2010).
13. "Advances and Future Prospects of STT-RAM", E. Chen, D. Apalkov, Z. Diao, A. Driskill-Smith, D. Druist, D. Lottis, V. Nikitin, X. Tang, S. Watts, S. Wang, S. A. Wolf, A. W. Ghosh, J. W. Lu, S. J. Poon, M. Stan, W. H. Butler, S. Gupta, C. K. A. Mewes, Tim Mewes, and P. B. Visscher, **Review article**, *IEEE Trans. Magn.* **46**, 1 (2010).
  14. "Optical and Electrical Measurement of Energy Transfer between Nanocrystalline Quantum Dots and Photosystem I", Hyeson Jung, Galina Gulis, Subhadra Gupta, Kevin Redding, David J. Gosztola, Gary P. Wiederrecht, Michael A. Stroscio, and Mitra Dutta, *J. Phys. Chem. Special issue: Michael R. Wasielewski Festschrift*, **114**, 14544 (2010).
  15. "Unidirectional magnetization relaxation in exchange biased films", T. Mewes, H. Lee, E. Edwards, M. Bradford, C. K. A. Mewes, Z. Tadisina, S. Gupta, and R. L. Stamps, *IEEE Magn. Lett.* **1**, 3500204 (2010).
  16. "Magnetic tunnel junctions with Co-based perpendicular magnetic anisotropy multilayers", Z. R. Tadisina, A. Natarajathinam, S. Gupta, *J. Vac. Sci. Technol.* **A28**, 973 (2010).
  17. "Preparation and properties of perpendicular CoPt magnetic nanodot arrays patterned by nanosphere lithography", Xiao Li, Zeenath R. Tadisina, Subhadra Gupta and Ganping Ju, *J. Vac. Sci. Technol.* **27**, 1062 (2009).
  18. "A statistical approach to optimization of alumina etching in a high density plasma," Xiao Li, Alton Highsmith, Subhadra Gupta, Ajit Paranjpe and Katrina Rook, *J. Appl. Phys.* **104**, 033307-1 (2008).
  19. "Thermal stability of synthetic antiferromagnet and hard magnet coupled spin valves," Zeenath R. Tadisina, Subhadra Gupta, Patrick LeClair, and Tim Mewes, *J. Vac. Sci. Technol.* **A 26**, 735 (2008).
  20. "Stress Optimization of FeCo/Ru Magnetic Multilayers", Jinmei Dong, Mrugesh Desai and Subhadra Gupta, *TMS Letters*, Vol. 3(2), pp.65-66 (2006).
  21. "Optimization of Process Parameters to Achieve High Quality As-Deposited Indium-Tin Oxide Films for Display Applications", S. Gupta and E. Ada, *J. Vac. Sci. Technol.* **A23**, 1173 (2005).
  22. "Super-Smooth Indium-Tin Oxide Thin Films by Negative Sputter Ion Beam Technology", M. H. Sohn, D. Kim, S. J. Kim, N. W. Paik and S. Gupta", *J. Vac. Sci. Technol.* **A 21**(4), 1347 (2003).
  23. "Low resistance spin dependent tunneling junctions with naturally oxidized tunneling barrier", Kyusik Sin, Chester Chien, Lena Miloslavsky, Shin Funada, Mark Miller, Hua-ching Tong and Subhadra Gupta, *IEEE Trans. Magn.* **36**, 2818 (2000).
  24. "Thickness and process optimization of planetary magnetron sputtered FeMn spin valves", Y. Feng, K. Rook, S. Gupta, Y. Huai, *J. Appl. Phys.* **87**, 6612 (2000).
  25. "Sputter deposition of 45% Ni-55% Fe for High Moment Poles", K. Rook, S. Gupta, R. Hieronymi, B. Murphy, *J. Appl. Phys.* **87**, 5843 (2000).
  26. "Collimated deposition of hard bias magnetic films via long-throw techniques", K. Rook, S. Gupta, Y. Feng, R. Hieronymi, B. Murphy, I. Wagner, S. Sanders, M. Watson, *J. Appl. Phys.* **87**, 5738 (2000). "Growth of Giant Magnetoresistive Spin Valves with Strong Exchange Bias field", G. Choe, A. Tsoukatos and S. Gupta, *IEEE Trans. Magn.* **34**, 867 (1998).
  27. "High exchange anisotropy and high blocking temperature in strongly textured NiFe (111)/FeMn

- (111) films”, G. Choe and S. Gupta, Appl. Phys. Lett. 70, 1766 (1997).
28. “Room Temperature GMR Studies in (Cr,Ta)/[Au/NiFe]<sub>n</sub> Multilayers”, A. Tsoukatos, S. Gupta, and Y. Huai, IEEE Trans. Magn. 33, 3514 (1997).
  29. “NiFe Underlayer Effects on Exchange Coupling Field and Coercivity in NiFe/FeMn Films”, G. Choe and S. Gupta, IEEE Trans. Magn. 33, 3691 (1997).
  30. “High coercivity CoPtCr, CoPt films deposited at high power and high bias conditions for hard bias applications in MR heads”, G. Choe, S. Funada, A. Tsoukatos and S. Gupta, J. Appl. Phys. 81, 4894 (1997).
  31. “Process optimization studies of high performance recordable minidisks”, G. Choe, J. Ishii and S. Gupta, J. Appl. Phys. 81, 3842 (1997).
  32. “Giant magnetoresistance and high sensitivity in annealed NiFeCo/Ag multilayers”, J. W. Dykes, Y. K. Kim, A. Tsoukatos, S. Gupta, S. C. Sanders, J. Appl. Phys. 79, 5584 (1996).
  33. “Deposition condition and thickness dependence on magnetic properties of sputtered NiFeCo thin films”, A. Tsoukatos, S. Gupta, and Y. K. Kim, J. Appl. Phys. 79, 5446 (1996).
  34. “Cr/(CoPtCr, CoPt<sub>x</sub>) layered film studies for hard bias applications”, A. Tsoukatos, S. Gupta and D. Marx, J. Appl. Phys. 79, 5018 (1996).
  35. “Rutherford Backscattering Evidence for Solid Phase Laser Annealing of Corning 7059 Glass and ZnO Thin Films,” S. Dutta, H. E. Jackson, J. T. Boyd and C. W. White, J. Appl. Phys. 54, 2125 (1983)
  36. “Use of Laser Annealing to Achieve Low Loss in Corning 7059 Glass, ZnO, Si<sub>3</sub>N<sub>4</sub>, Nb<sub>2</sub>O<sub>5</sub> and Ta<sub>2</sub>O<sub>5</sub> Optical Thin-Film Waveguides,” S. Dutta, H. E. Jackson and J. T. Boyd, Opt. Engineering 22, 117 (1983).
  37. “Laser Assisted Deposition,” S. Dutta, Proc. JPL Research Forum on Photovoltaic Metallization Systems, 1983 (Invited Paper).
  38. “CO<sub>2</sub> Laser Annealing of Si<sub>3</sub>N<sub>4</sub>, Nb<sub>2</sub>O<sub>5</sub> and Ta<sub>2</sub>O<sub>5</sub> Thin-Film Optical Waveguides to Achieve Scattering Loss Reduction,” S. Dutta, H. E. Jackson, J.T. Boyd, F. S. Hickernell and R. L. Davis, IEEE J. Quantum Electron. QE-18, 800 (1982).
  39. “Laser Annealing of ZnO Optical Waveguides,” S. Dutta, J. T. Boyd and H. E. Jackson, Bull. Am. Phys. Soc. 27, 323 (1982).
  40. “Reduction of the Effects of Scattering by Laser Annealing of Optical Waveguides and by Use of Integrated Waveguide Detection,” J.T. Boyd, S. Dutta, H. E. Jackson and A. Naumann, Opt. Engineering 21, (1982).
  41. “Scattering Loss reduction in ZnO Optical Waveguides by Laser Annealing,” S. Dutta, H. E. Jackson, J. T. Boyd, F. S. Hickernell and R. L. Davis, Appl. Phys. Lett. 39, 206 (1981).
  42. “Extremely Low-Loss Glass Thin-Film Optical Waveguides Utilizing Surface Coating and Laser Annealing,” S. Dutta, H. E. Jackson and J. T. Boyd, J. Appl. Phys. 52, 3873 (1981).
  43. “Reduction of Scattering From a Glass Thin-Film Optical Waveguide by CO<sub>2</sub> Laser Annealing,” S. Dutta, H. E. Jackson and J. T. Boyd, Appl. Phys. Lett. 37, 512 (1980).

## REFEREED CONFERENCE PROCEEDINGS:

1. "A Statistical Approach to Block Copolymer Templating of Co/Pd Multilayers," A. G. Owen, A. Montgomery, R. Douglas, H. Su and S. Gupta, TMS Supplemental Conference Proceedings (2015).
2. "Switching characteristics and magnetoresistance of Co-based multilayered perpendicular magnetic tunnel junctions", Zeenath R. Tadisina, Anusha Natarajarathinam and Subhadra Gupta, *Advanced Materials for half-metallic and organic spintronics-2009*, edited by Minn-Tsong Lin, Claudia Felser, Jian Shen and Arunava Gupta, Mater. Res. Soc. Symp. Proc. **Volume 1198E**, Warrendale, PA, 2010.
3. Z. Tadisina, S. Gupta, C. Papusoi, H. Fujiwara, R. Morris, and G. Thompson, "Grain Size Refinement in Cu bottom lead in CPP GMR Stack", Mater. Res. Soc. Symp. Proc. **Vol. 961**, 0961-O12-01 (2007).
4. C. Srivastava, G. B. Thompson, D. Reinhard, J. Sebastian, T. J. Prosa, D. J. Larson, Z. T. Reddy, S. Gupta, W. Butler and M. L. Weaver, "Atom Probe Tomography of Al-Cu Precipitation in an Al-5at%Cu Thin Film", Microscopy and Microanalysis Proceedings, 12 (Supp 2) (2006).
5. "Magnetoresistance in Spin-Dependent Tunneling Junctions Fabricated by Ion Beam Deposition", J. Wang, A. Devasahayam, S. Gupta, H. Hegde, J. Xiao, G. Landry, S. Basu, presented at 44<sup>th</sup> Conf. On Magnetism and Magnetic Materials, San Jose, CA, 15-18 November, 1999.
6. "Hard Magnetic Bias Layers for Magnetoresistive Head Applications", A. Tsoukatos, S. Gupta and J. Ishii, Proc. Int'l. Symp. On Sputtering Plasmas, May 1995.
7. "DC-Reactive Sputtering of Al<sub>2</sub>O<sub>3</sub>," M. Alex, C. Van Nutt, and S. Gupta, Proc. Int'l. Symp. on Sputtering Plasmas, May, 1993.
8. "DC-Reactive Sputtering of Al<sub>2</sub>O<sub>3</sub> for Thin-Film Recording Heads," M. Alex, C. Van Nutt, and S. Gupta, Proc. Sony Research Forum, 255, November, 1993.
9. "High Quality Indium-Tin Oxide Films by DC Reactive Magnetron Sputtering in Production Systems," S. Gupta, C. Van Nutt, and L-A. Smith, Proc. Sony Research Forum, 311, November 1993.
10. "Planarization of Sputtered Aluminum Films," I. Wagner, S. Gupta, H. Gilboa, Y.H. Park and L. Wharton, Proc. SEMICON/EAST '86, Boston, MA (1986).
11. "Laser-Written Metallization Patterns for Low-Cost High-Efficiency Solar Cells," A. Rohatgi, S. Gupta, P.G. McMullin, P.A. Palaschak, P. Rai-Choudhury and B. D. Gallagher, Proc. 18<sup>th</sup> IEEE Photovoltaic Specialists Conference, Las Vegas, Nevada (1985).
12. "The Feasibility of Silicon-on-Garnet Technology," P.H.L. Rasky, D.W. Greve, M. H. Kryder and S. Dutta, Proc. Magn. and Magn. Mat'ls. (1984).
13. "Laser-Enhanced Metallization Processes for Solar Cells," B. D. Gallagher, S. Dutta, P.G. McMullin and P. Rai-Choudhury, Proc. ISHM Microelectronics Conf. (1984).
14. "Laser Metallization of Solar Cells," S. Dutta, P.G. McMullin, P. Rai-Choudhury and B. D. Gallagher, Proc. Conf. on Lasers and Electro-Optics (1984).
15. "Cap Layers for Silicon-on-Insulator Films Produced by Laser or Strip Heater Recrystallization," P.G. McMullin and S. Dutta, Extended Abstracts, Electrochemical Society, Spring Meeting 83-1, 146 (1983).
16. "Use of Laser Annealing to Achieve Low Loss in Corning 7059 Glass, ZnO, Si<sub>3</sub>N<sub>4</sub>, Nb<sub>2</sub>O<sub>5</sub> and Ta<sub>2</sub>O<sub>5</sub> Optical Thin-Film Waveguides," S. Dutta, H. E. Jackson and J. T. Boyd, Proc. SPIE Meeting **321**, 23 (1982).

17. "Optical Waveguide Loss Reduction in Zinc Oxide by Laser Annealing," F. S. Hickernell, R. L. Davis, S. Dutta, J. T. Boyd and H. E. Jackson, Proc. AIME Materials Research Conference (1981).
18. "Progress in Research on Optical Waveguide Structures Formed on Silicon Substrates," J.T. Boyd, S. L. Chen, R. W. Wu, S. Dutta and H. E. Jackson, Proc. NSF Grantee-User Meeting on Opt. Commun. (1981).
19. "The Use of Laser Annealing and Surface Coating to Fabricate Very Low Loss Thin-Film Glass Waveguides," S. Dutta, H. E. Jackson and J. T. Boyd, Proc. Third Int'l. Conf. on Integrated Optics and Optical Fiber Communications (1981).
20. "Reduction of the Effects of Scattering by Laser Annealing of Optical Waveguides and by Use of Integrated Waveguide Detection," J. T. Boyd, S. Dutta, H. E. Jackson and A. Naumann, Proc. SPIE Meeting (1981).
21. "Progress in Research on Integrated Optical Devices Involving Silicon Substrates," J. T. Boyd, S. Sriram, S. L. Chang, H. E. Jackson and S. Dutta, Proc. NSF Grantee-User Meeting on Opt. Commun. (1980).

#### **SELECTED CONFERENCE PRESENTATIONS:**

1. "A Statistical Approach to Block Copolymer Templating of Co/Pd Multilayers", H. Su, A. G. Owen, R. Douglas, A. Montgomery and S. Gupta, TMS 144th Annual Meeting, Orlando, FL, March 2015.
2. H. Su and S. Gupta, "Microstructure Evolution and Magnetic Properties of FeB/Pt Multilayers and FeB/Pt Composite Films", 58th MMM Conference, Denver, CO, November 2013.
3. "A Statistical Approach to Block Copolymer Templating of Co/Pd Multilayers", Allen Owen, Robert Douglas, Hao Su, Alton Highsmith and Subhadra Gupta, MINT Fall Review, Tuscaloosa, AL, November 2013.
4. "Nanorods of Co/Pd Multilayers Fabricated by Glancing Angle Deposition for Advanced Media", Hao Su and Subhadra Gupta, MINT Fall Review, Tuscaloosa, AL, November 2013.
5. "Combined Interface and Bulk Anisotropy Free layers for MgO based MTJ: Anisotropy, Interlayer Coupling and Spin Torque", Amritpla Singh, Sam Schwarm, Michael Carton, Oleg Mryasov and Subhadra Gupta, MINT Fall Review, Tuscaloosa, AL, November 2013.
6. "Patterning Approaches to Nanoporous Silicon", Angelique Montgomery, Hao Su, Allen Owen, Tyler Miller, Alton Highsmith and Subhadra Gupta, MINT Fall Review, Tuscaloosa, AL, November 2013.
7. "A Design of Experiments on Co/Pd Multilayers Patterned by Block Copolymer Templating", Allen Owen, Angelique Montgomery, Hao Su and Subhadra Gupta, 60<sup>th</sup> American Vacuum Society Symposium, Long Beach, CA, November 2013.
8. "Optimization of Perpendicular Magnetic Tunnel Junctions with Various Annealing Conditions", Anusha Natarajarathinam, Amritpal Singh, Billy D. Clark, Robert Douglas, and Subhadra Gupta, MINT Fall Review, Tuscaloosa, AL, November 2012.
9. "Nanorod formation by glancing angle deposition compared with lithography techniques for advanced media", Hao Su, Allen Owen, Angelique Montgomery, A. Natarajarathinam and Subhadra Gupta, MINT Fall Review, Tuscaloosa, AL, November 2012.
10. "A Comparison of Advanced Media Nanopatterning Using Nanosphere Lithography versus Block Copolymer Templating", oral presentation, A. Owen, H. Su, A. Montgomery, and S.Gupta, 59<sup>th</sup> AVS Annual Symposium, Tampa FL, Oct 26-November 1, 2012.
11. "Block Copolymer Templating and Glancing Angle Deposition of Co/Pd Nanopillars," poster presentation, Hao Su, Allen Owen, Angelique Montgomery, Robert Douglas and S. Gupta, MINT Fall Review, Tuscaloosa, AL, October 2012.

12. **“Optimization of Perpendicular Magnetic Tunnel Junctions by Rapid Thermal Annealing,”** S. Gupta (invited), AVS Tennessee Valley Chapter Meeting, Oak Ridge National Laboratories, September 11-14, 2012.
13. **“Influence of Rapid Thermal Annealing on Tunneling Magnetoresistance of Perpendicular Magnetic Tunnel Junctions,”** S. Gupta, Worldwide Universities Network 4<sup>th</sup> International Conference on Spintronics, July-23-25, 2012 (invited), Sydney, Australia.
14. **“Ultrathin free layer optimization for perpendicular magnetic tunnel junctions,”** S. Gupta, A. Natarajarathinam, S. Schäfer, A. Singh, T. Mewes, W. H. Butler and E. Chen (oral), IEEE International Magnetics Conference, May 7-11, 2012, Vancouver, Canada.
15. **“Perpendicular Magnetic Tunnel Junction Material Systems for Spin-Torque Transfer ”,** S. Gupta and A. Natarajarathinam (invited), TMS Symposium 2012, March 11-15, Orlando, FL
16. **“Nanosphere Lithography of Co/Pd Multilayer Films for Advanced Media,”** Suzanne Kornegay, Shraeyansh Thakur, Erica Barnes, Anondo Bannerjee, Marelly Villnueva, Hao Su, Zhenzhong Sun, Dawen Li and Subhadra Gupta (oral), TMS Symposium 2012, March 11-15, Orlando, FL.
17. **“Optimization of CoPt-AlN Granular Media for High Density Applications,”** Hao Su, Anusha Natarajarathinam, Elizabeth Philip, Kristy Tippey and Subhadra Gupta (oral), TMS Symposium 2012, March 11-15, Orlando, FL.
18. **“Micro magnetic exchange tensor and magnetization switching of hep Co alloy based thin film nano-structures,”** A. Singh, O. Mryasov, S. Gupta, X. Wang and E. Girt (poster), IEEE International Magnetics Conference, May 7-11, 2012, Vancouver, Canada.
19. **“Perpendicular Magnetic Tunnel Junctions based on Thin CoFeB Free Layer and Co-based Multilayer SAF Pinned Layers,”** A. Natarajarathinam, R. Zhu, A. Singh, H. Su, P. B. Visscher and S. Gupta (oral), 56<sup>th</sup> Conference on Magnetism and Magnetic Materials, October 30-November 3, 2011, Scottsdale, AZ.
20. **“Perpendicular Magnetic Tunnel Junctions for STT-RAM,”** S. Gupta, A. Natarajarathinam, R. Zhu, and P. Visscher (oral), American Vacuum Society 58<sup>th</sup> International Symposium, October 30-November 4, 2011, Nashville, TN.
21. **“Effect of vanadium concentration on the magnetic moment in CoFeB thin films,”** M. Pathak, Z. R. Tadisina, A. Natarajarathinam, P. R. LeClair and S. Gupta (oral), 55<sup>th</sup> Conference on Magnetism and Magnetic Materials, November 14-18, 2010, Atlanta, GA.
22. **“Interface-induced partial perpendicular anisotropy in V-capped and V-doped CoFeB,”** A. Natarajarathinam, Z. R. Tadisina, M. Pathak, S. Gupta, T. Mewes and P. R. LeClair (oral), 55<sup>th</sup> Conference on Magnetism and Magnetic Materials, November 14-18, 2010, Atlanta, GA.
23. **“Effect of capping layers on partial perpendicular anisotropy of CoFeB in magnetic tunnel junctions,”** S. Gupta, A. Natarajarathinam, Z. Tadisina, and T. Mewes (oral), American Vacuum Society 57<sup>th</sup> International Symposium, October 17-22, 2010, Albuquerque, NM.
24. **“Nanolaminates with Perpendicular Magnetic Anisotropy for Low Energy, Nonvolatile Memory,”**, S. Gupta and A. Natarajarathinam (invited), MS&T 2010, October 17-21, Houston, TX.
25. **“Perpendicular magnetic tunnel junctions using Co-based multilayers and alloys,”** S. Gupta, Z. R. Tadisina and A. Natarajarathinam (oral), 11<sup>th</sup> Joint MMM-Intermag Conference, January 18-22, 2010, Washington, D.C.
26. **“Spin Transfer Switching in Magnetic Tunnel Junctions with Co-based Perpendicular Anisotropy Multilayers,”** Z. R. Tadisina, A. Natarajarathinam, S. Gupta, T. Mewes, P. LeClair, E. Chen, S.

Wang, and W. F. Egelhoff (oral), American Vacuum Society 56<sup>th</sup> International Symposium, November 8-13, 2009, San Jose, CA.

27. "Electronic Properties and CPP-GMR Sensor Fabrication Based on Co<sub>2</sub>FeSi and Co<sub>2</sub>MnSi Heusler Alloys", Zeenath R. Tadisina, Courtney L. Guenther, Tianyi Xu, Xiao, Li, Subhadra Gupta, William H. Butler, Patrick LeClair and Claudia Felser (oral), Materials Research Society Fall Meeting, December 1-5, 2008, Boston, MA.
28. "Structural Properties of Heusler Alloy Thin Films as a Function of Target Preparation, Substrate Conditions and Sputtering Parameters," Subhadra Gupta, Zeenath R. Tadisina, Xiao Li, Yuki Inaba, Karen L. Torres, Gregory B. Thompson, Tim Mewes, and Patrick LeClair (oral), Materials Research Society Fall Meeting, December 1-5, 2008, Boston, MA.
29. "A comparison of nanosphere lithography and block copolymer templating for patterning CoPt/CoPtCr perpendicular media," X. Li, S. Gupta, M. Curry and M. Bakker (oral), 53<sup>rd</sup> Conference of Magnetism and Magnetic Materials, 10-14 November 2008, Austin, TX.
30. "Perpendicular Anisotropy Graded CoPt/CoPtCr Magnetic Pillars Patterned by Nanosphere Lithography," X. Li, Z. R. Tadisina, A. L. Highsmith, S. Gupta, Y. Inaba, and J. W. Harrell (oral), American Vacuum Society 55<sup>th</sup> International Symposium, October 19-24, 2008, Boston, MA.
31. "Using e-beam lithography and stepwise planarization to make CPP-GMR devices," S. Gupta (invited), National Nanoscience Infrastructure Network Annual Review, May 9-11, 2008, Ann Arbor, MI.
32. "Fabrication of Heusler alloy-based CPP-GMR devices using ICP-RIE planarization for self-alignment of nanosized features," Z. R. Tadisina, X. Li, C. A. Culbert, C. L. Guenther, M. Pathak, T. Xu, V. Mohandoss, P. LeClair, W. H. Butler and S. Gupta, 52<sup>nd</sup> Conference on Magnetism and Magnetic Materials, November 5-9, 2007, Tampa, FL.
33. "Thermal Stability of Various Exchange-Coupled Spin Valves," Z. Tadisina, P. LeClair, T. Mewes and S. Gupta, American Vacuum Society 54<sup>th</sup> International Symposium, October 14-19, 2007, Seattle, WA.
34. "Formation of Controlled Copper Current Paths in Alumina Nano-Oxide Layers for GMR Spin Valves by Rapid Thermal Processing of Al-Cu Sputtered Films, Zeenath Tadisina, Rajeshchandra Thunuguntla, Subhadra Gupta, Robb Morris, Gregory Thompson, Jian Zhong, and Raghavendra Pandey (oral), TMS 2007, 136<sup>th</sup> Annual Meeting, Orlando FL.
35. "Control of Cu confined current paths in CCP-CPP-GMR spin valves by rapid thermal annealing," S. Gupta, Z. R. Tadisina, C. Papusoi, H. Fujiwara, J. Zhong, and R. K. Pandey (oral), 10<sup>th</sup> Joint MMM-Intermag Conference, January 7-11, 2007, Baltimore, MD.
36. "Rapid Thermal Annealing of Indium Tin Oxide Films on Flexible Substrates," R. Thunuguntla, D. Bottesch, and S. Gupta (oral), American Vacuum Society 53<sup>rd</sup> International Symposium, November 12-17, 2006, San Francisco, CA.
37. "Investigation of high moment FeCo films for head writer applications, J. Dong, R. Thunuguntla, S. Gupta and M. Desai (oral), IEEE International Magnetism Conference, May 8-12, 2006, San Diego, CA.
38. "Effect of Dendrimer Underlayers on Sputtered Indium-Tin Oxide Thin Film Microstructure, Morphology, Optical and Electrical Properties, R. Thunuguntla, S. Street, and S. Gupta (oral), American Vacuum Society 52<sup>nd</sup> International Symposium, October 30-November 4, 2005, Boston, MA.

39. "Correlation of Stress and Magnetostriction in High Moment FeCo/Ru Multilayers," The 16<sup>th</sup> Magnetic Recording Conference (poster), August 15-17, Stanford, CA (2005).
40. "Crystal Structure, Morphology and Electrical Properties of Indium Tin Oxide Films Optimized as a Function of Power, Pressure and Temperature", Rajeshchandra Thunuguntla and Subhadra Gupta (poster), Society of Vacuum Coaters, April 5-8, 2005, Colorado Springs, CO.
41. "Stress Optimization of FeCo/Ru Multilayers," Jinmei Dong, Mrugesh Desai and Subhadra Gupta (poster), 2005 TMS Annual Meeting, February 13-17, San Francisco, CA.
42. "Influence of lamination frequency on magnetostriction in soft, high moment, sputtered Ru/FeCo multilayers," C. Alexander, S. Gupta, J. L. Weston, and K. Rook (oral), 49<sup>th</sup> Annual Conference on Magnetism and Magnetic Materials, November 7-11, 2004, Jacksonville, FL.
43. "Optimization of Process Parameters to Achieve High Quality as-Deposited Indium Tin Oxide (ITO) Films for Display Applications", S. Gupta (oral), American Vacuum Society 51<sup>st</sup> International Symposium, November 14-19, 2004, Anaheim, CA.
44. "Overview of Thin-Film Head Processes", S. Gupta, A. Tsoukatos and T. Yasar, IDEMA MR Head/Media Symposium, February 1996 (invited).
45. "Laser-Written Metallization Patterns for Solar Cell Applications," S. Dutta, P.G. McMullin, P. Rai-Choudhury and B. D. Gallagher, Extended Abstracts, Laser Chemical Processing Symposium, Materials Research Society, Fall Meeting (1984).
46. "Effect of Laser Annealing on Bulk and Surface Scattering Losses in Thin-Film Glass Waveguides," S. Dutta, J. T. Boyd and H. E. Jackson, Bull. Am. Phys. Soc. 26, 418 (1981).
47. "CO<sub>2</sub> Laser Annealing of Integrated Optical Waveguides," S. Dutta, H. E. Jackson and J. T. Boyd, Bull. Am. Phys. Soc. 26, 709 (1981).

#### **NON-REFEREED PUBLICATIONS:**

1. "Forming dielectric films using high-rate DC reactive processes", S. Gupta and B. Murphy, Solid State Technology, May 2003.
2. "Highly Uniform Dielectric Films Using a Combined Linear Scanning, Velocity Profiling and Planetary Rotating Motion", S. Gupta, A. Ruspini, and M. Fregeau, Vacuum Technology and Coating, 48, December 2002.
3. "Sputter Deposition of Metal on Compound Semiconductor Wafers with Minimum Damage", Bhola N. De, Mohsen Shokrani and Subhadra Gupta, Compound Semiconductor, December 2000.
4. "Deposition and Patterning Technologies for Advanced Write Pole and Shield Formation", K. Rook, D. Hines, I. Wagner, R. Hieronymi, K. Williams, S. Gupta, 119, Datatech, Autumn 1999.
5. "Collimated DC Magnetron Deposition of Hard Bias Magnetic Films via Long-Throw Techniques", K. Rook, S. Gupta, R. Hieronymi and I. Wagner, Application Note, August 1999.
6. "High-Rate DC Magnetron Sputter-Deposited 45% Ni-55% Fe for High Moment Write Pole Applications", K. Rook, S. Gupta and R. Hieronymi, Application Note, August 1999.
7. "Soft, Oriented Magnetic Films Developed for Pole Materials in Thin Film Head Applications: CoZrNb", A. Tsoukatos, S. Gupta and J. Ishii, Application Note, November 1995.
8. "Soft, Oriented Magnetic Films Developed for Pole Materials in Thin Film Head Applications: CoZrNb", A. Tsoukatos, S. Gupta and J. Ishii, Application Note, November 1995.

9. "Controlling magnetic head properties through sputtering", S. Gupta, A. Tsoukatos, G. Chaput and L.E. Tagliani, Data Storage, July/August 1995.
10. "Soft, Oriented Magnetic Films Developed for Pole Materials in Thin Film Head Applications", A. Tsoukatos, S. Gupta and J. Ishii, Application Note, March 1995.
11. "Oriented NiFe Films Developed for Thin Film Head Applications", A. Tsoukatos, S. Gupta, C. Van Nutt and J. Ishii, Application Note, March 1995.
12. "A statistically designed experimental optimization of hard bias magnetic films for magnetoresistive head applications", A. Tsoukatos, S. Gupta and J. Ishii, Application Note, September 1994.
13. "Reactive Sputtering," S. Gupta and C. Van Nutt, MRC Thin Films School Handbook (1991).
14. "High T<sub>c</sub> Superconductors," S. Gupta, Presented as part of a graduate course on Thin Film Technology at Brooklyn Polytechnic Institute, November 1991.
15. "Bi-Sr-Ca-Cu-O Superconducting Thin Films on Sapphire and Alumina Substrates," I. J. Wang, M. Narasimhan, and S. Gupta, Proc. Mat'ls. Res. Soc. Spring Meeting, 1990.
16. "Materials for Contacts, Barriers and Interconnects," S. Gupta, J-S. Song, and V. Ramachandran, Semiconductor International, September 1988.
17. "Materials for Contacts, Barriers and Interconnects," S. Gupta and V. Ramachandran, MRC 42<sup>nd</sup> Sputter School Handbook (1988).
18. "Aluminum Planarization for VLSI Applications," S. Gupta, I. Wagner, S. Hurwitt and L. Wharton, Semiconductor International, September 1987.
19. "Planarization of Bias Sputtered Quartz," S. Gupta and H. Gilboa, MRC 39<sup>th</sup> Sputter School Handbook (1987).
20. "Bias Sputtered Quartz Interlayer Dielectric Films in a Batch-Type Production System," H. Gilboa and S. Gupta, MRC 38<sup>th</sup> Sputter School Handbook (1986).
21. "Planarization of Aluminum Films in Production Sputtering Systems," I. Wagner, H. Gilboa, Y. H. Park, S. Gupta and L. Wharton, MRC 38<sup>th</sup> Sputter School Handbook (1986).