Dr. CHRISTOPHER J. SUMMERS
Professor
School of Materials Science & Engineering
Director
Phosphor Technology Center of Excellence
Georgia Institute of Technology

I. EARNED DEGREES

B.Sc. (Spec. Hons.) Physics	University of Reading, U.K.	1962
Ph.D. Physics	University of Reading, U.K.	1966

II. EMPLOYMENT

Reading University	Research Fellow	1965-1967
Bell Telephone Laboratories	Postdoctoral Staff Member	1967-1969
General Telephone Laboratories	Technical Staff Member	1969-1972
McDonnell Douglas Research Labs	Scientist	1972-1979
	Senior Scientist	1979-1981
Georgia Tech Research Institute	Principal Research Scientist	1981-1998
	Head - Quantum Microstructures Branch	1984-1991
	Director - Physical Sciences Laboratory	1985-1991
	Associate Director - Electro-Optics, Environment & Materials Laboratory	1991-1998
	Fellow - Georgia Tech Research Institute	1991-Present
	Director - Phosphor Technology Center of Excellence	1993-Present
Georgia Institute of Technology	Adjunct Professor, School of Materials Science & Engineering	1988-1998
Georgia Institute of Technology	Adjunct Professor, School of Electrical Engineering	1989-Present
Georgia Institute of Technology	Adjunct Professor, Physics Department	1984-Present
Emory University	Adjunct Professor, Physics Department	1987-1999
Georgia Institute of Technology	Professor, School of Materials Science & Engineering	1998-Present

III. TEACHING

A. INDIVIDUAL STUDENT GUIDANCE

Visiting Scientists

Dr. Rolf Haugen, Norwegian Telecom, Oslo, Norway	1987-1989
Dr. Kenji Maruyama, Fujitsu Research Laboratory; Tokyo, Japan	1989-1991
Dr. Jens Tomm, Humboldt University of Berlin, Germany	1994-1995
Dr. Silke Schön, Humboldt University of Berlin, Germany	1995-1997
Dr. Rhim Youl Lee, Dankook University; Seoul, Korea	1997-1998
Dr. Jean-Charles Souriau, LETI Research Laboratory; Grenoble, France	1997-1998
Dr. Kazuhito Yasuda, Nagoya Institute of Technology; Nagoya, Japan	1998-1999

Dr. Hiroko Kominami, Shizuoka University, Japan 2001-2003
Dr. Habio Rao, University, China 2003-2004

Postdoctoral Fellows Supervised

Dr. J. David Benson, “Growth Studies of Photon-Assisted Molecular Beam Epitaxial Grown CdTe,” 3/88-10/89.

Dr. Lilly H. Zhang, “Growth and Doping of Mercury Cadmium Telluride by Molecular Beam Epitaxy,” 9/95-12/97.

Dr. John Penczek, " Characterization and Properties of Field Emission Phosphors,"

Dr. Yongbao Xin, “ with Prof. Wang, “Molecular Beam Epitaxy of SrS and Related Materials,” 6/97-2000.

Dr. Chulsoo Yoon, Synthesis of Plasma Display and X-Ray Phosphors," 2/2002 – 10/2003

Dr Jeffrey King, “Non-Close Packed Photonic Crystal Opals”, 8/2004 – 1/2006

Dr. Elton Graugnard, “Atomic Layer Epitaxy for Photonic Crystal Applications,” 3/2003 – present

Ph.D. Students Supervised

Dr. J. David Benson (PHYSICS), “Surface Reaction Kinetics of Molecular Beam Epitaxially Grown CdTe,” graduated March 1988.

Dr. Brent K. Wagner (ECE), “Molecular Beam Epitaxial Growth of CdTe and HgCdTe for New Infrared and Optoelectronic Devices,” graduated Summer 1991.

Dr. Damodaran Rajavel (MSE), “Molecular Beam Epitaxial and Chemical Beam Epitaxial Growth and Doping Studies of (001) CdTe,” graduated Summer 1991.

Dr. H. Kenny Chiang (ECE), “AlGaAs Waveguide Switching Devices: Experimental Techniques and Theoretical Analysis,” graduated Winter 1991.

Dr. Pascal Aristin, University of Toulouse, “Fabrication et Characterization de Photodiodes a Avalanche a Puits Quantiques Multiples GaAs/$Al_xGa_{1-x}As$,” graduated Spring 1992.

Dr. Rudy G. Benz II (PHYSICS), “Surface Growth Kinetics in Molecular Beam Epitaxy and Gas Source Molecular Beam Epitaxy of CdTe,” graduated Summer 1992.

Dr. Mason Gross (ECE), “Optical Bistable Switching Elements in AlGaAs/GaAs Superlattice Structures,” graduated Winter 1994.

Dr. Wusheng Tong (PHYSICS), “Chemical Beam Epitaxial Growth of ZnS: Growth Kinetics and Novel Electroluminescent Structures,” graduated June 1996.

Dr. Tuyen K. Tran (PHYSICS), “Optical Properties of II-VI Materials and Superlattices Structures,” graduated March 1996.

Dr. Ashesh Parikh (MSE), “Thermodynamics and Surface Kinetics of the Growth and Doping of HgCdTe Heterostructure by Metalorganic Molecular Beam Epitaxy,” graduated May 1996.

Dr. Hicham Menkara (PHYSICS), "A Comprehensive Analysis of the Physical Properties of Advanced GaAs/AlGaAs Junctions," graduated June 1997.

Dr. Wounjhang Park (PHYSICS), "Optical Properties of Thin Film Phosphors," graduated June 1997.

Dr. Christian Stoffers (PHYSICS), "Saturation Kinetics of Low Voltage Phosphors," graduated June 1997.

Dr. Sen Yang (PHYSICS), "Characterization of Low Voltage Cathodoluminescent Phosphors for Field Emission Displays," graduated September 1998.

Dr. Fu-Li Zhang (PHYSICS), "An Experimental and Theoretical Study of New Phosphors for Full Color Field Emission Displays," graduated Spring 1999.

Dr. Thomas C. Jones (PHYSICS), "Spectroscopic Studies of SrS," graduated Spring 1999.

Yongdong Jiang (MSE - with Prof. Z.L. Wang), Ph.D., "Synthesis and Characterization of Sulfide Phosphors," graduated Winter 1999.

Mohammad Chaichimansour (ECE), Ph.D., "Electro-Optical Characterization of Alternating-Current Thin Film Electroluminescent Devices," graduated Spring 2000.

Edris Mohammed (PHYSICS), Ph.D., "Luminescence Properties of $Sr_xCa_{1-x}S$:Cu Thin Film Phosphors for Flat Panel Displays," graduated Fall 2000.

Patrick Manigault (PHYSICS), Ph.D., "Second Order Luminescent Saturation Effects in Phosphors," graduated Summer 2001.

Chekesha Liddell, Ph.D. Thesis: Non-Spherical ZnS Colloids as Building Blocks for Three-Dimensional Photonic Crystals. (Summer 2003)

Jeff King, Ph. D. Thesis Title: Fabrication of Opal-based Photonic Crystals using Atomic Layer Deposition. (August 2004)

Tsuyoshi Yamashita, Ph.D. Thesis Title: Unraveling Photonic Bands: Characterization of Self-Collimation Effects in Two-Dimensional Photonic Crystals. (August 2005)

Curtis Neff, Ph. D. Thesis Title: Optical Properties of Superlattice Photonic Crystals, (December 2005)

Xudong Wang, Ph. D. Thesis Title: Patterned and Aligned ZnO 1D Nanostructures: Fabrication, Characterization and Applications (November 2005)

Davy Gaillot, Ph. D. Thesis Title: Photonic Crystals: Microcavity and Dispersion Effects

Richard Gilstrap, Ph. D. Thesis Title: Nano-Phosphors for Solid-State Lighting

Zhitao Kang, Ph. D. Thesis Title: Preparation of new phosphor systems for X-ray detectors and Solid State Lighting

Mathew Kane: Ph. D. Thesis: InGaN for Solid State Lighting

John Blair, Ph. D. Thesis Title: Novel 2D Photonic Crystal Structures

Master Thesis Students Supervised

Jonathan Goldman (MSE), M.S. Thesis, “Characterization of ZnS Grown by Molecular Beam Epitaxy on (001) and (111) Silicon Substrates,” graduated Winter 1988.

Frank Mueller (PHYSICS), University of Karlsruhe, Fullbright Student, Winter 1990, M.S. Thesis “In-situ Surface Temperature Measurements for the Molecular Beam Epitaxial Growth of CdTe, ZnTe and CdZnTe,” graduated Winter 1990.

August Conte-Mattes (MSE), M.S. Thesis, “Chemical Beam Epitaxy Growth of ZnTe on (001) GaAs,” graduated Winter 1992.

Ix-Li Shen (MSE), M.S. Thesis, “Chemical Beam Epitaxial Growth of (001) ZnS,” graduated Summer 1994.

Tao Yang (PHYSICS), M.S., “Gas Source Molecular Beam Epitaxy of Strontium Sulfide,” graduated Spring 2000.

Ram Gopalakrishnan (ISYE), M.S., "Synthesis of X-ray Phosphors", 2002- 2003

Dawn Hieneman (MSE), M.S., "Atomic Layer Deposition of TiO_2 for Photonic Crystal Waveguides" 2001 – 4/2004

Ogundiran Soumonni, (MSE), MS: Luminescence of Metaniobates, April, 2004

Richard Gilstrap (MSE), M.S., "Synthesis and Characterization of Blue Phosphors for Plasma Displays, 2001-2004

Master Students Supervised

Henry Zenzie (PHYSICS), 9/85-6/87
Stephen D. Pearson (MSE), 1986
Mannish Guppy (EE), 6/88-90
Sonja Moan (EE), 9/89-90
James Xu (ECE), 1996
Xinghai Tang (ECE), 1996
Thomas Krygowski (ECE), 1996
Jonathan Mason (PHYSICS), 1996
Myint Myint Kyi (PHYSICS), 1997
William Ogle (PHYSICS), 1997
Andrew D. Cooper (MSE), 1997
Jinseong Choi, (PHYSICS), 1998
Carol Poirot (MSE), 1998.
Gary Russell (MSE), 1999

B. OTHER TEACHING ACTIVITIES

Academic Courses Taught

Summer Quarter 1995, MATE 8103B, Phosphor and Luminescent Materials
Winter Quarter 1999, MATE 3312, Electrical Conduction in Materials
Fall Semester 1999 - 2001 MSE 4004, Materials in Electronic Applications

Fall Semester 1999 - 2001MSE 6210, Defects
Spring Semester 2000 - 2006, MSE 3015, Electrical, Optical and Magnetic Properties of Materials
Fall Semester 2002, MSE 2001, Introduction to Materials Science
Spring Semester 2001, 2003, MSE 7010, Electrical and Optoelectronic Properties of Ceramics
Fall Semester 2003, MSE 3015, Electrical, Optical and Magnetic Properties of Materials
Fall Semester 2003, MSE 3308/8803, Nanoscience and Nanotechnology
Spring Semester 2005-2006, Optical Measurement laboratory

IV. SCHOLARLY ACCOMPLISHMENTS

A. PUBLISHED BOOKS AND PARTS OF BOOKS

1. "Crystal Growth and Properties of $Hg_{1-x}Cd_xSe$ Alloys," *Semiconductors and Semimetals* **16**, (R. K. Willardson and A. C. Beer, Ed.), Academic Press, New York, pages 53-118, 1981, with J. G. Broerman and C. R. Whitsett.

2. "Chemical Beam Epitaxy for HgCdTe and Related Compounds," *Progress in Materials and Characterization* **29**, 161-216, (J. B. Mullen, Ed.), Great Britain Elsevier Science, Ltd., with R. G. Benz and B. K. Wagner, 1995.

3. Guest Editor, *Journal of the Society for Information Display*, 1996. Editor: A. Sobel.

4. Guest Editor, *Annual Review of Materials* **27**, Annual Reviews, Inc., Palo Alto, California, 1997. Editors: Kaufman, Girodmaine and Wachtman.

5. "Flat Panel Display Materials II," *Materials Research Society Symposium Proceedings* **424,** 1997, Editors: M. K. Hatalis, J. Kanicki, C. J. Summers and F. Funada.

6. Guest Editor, *Displays*, selected papers from the 1999 Fifth IUMRS International Conference on Advanced Materials, Beijing, 1999.

B. REFEREED PUBLICATIONS

1. C. R. Pigeon, C. J. Summers, J. Aria and S. D. Smith, "The Effect of Uniaxial Strain of Faraday Rotation in Germanium and Indium Antimonide," *Proceedings of the 7th International Conference on Physics of Semiconductors*, Paris, France, 289, 1964.

2. D. S. S. Bagguley, C. Vella-Coleiro, S. D. Smith and C. J. Summers, "Zeeman Effect of Acceptor States in Semiconducting Diamond," *Proceedings of the 8th International Conference on Physics of Semiconductors, Journal of the Physics Society of Japan*, **21**, Suppl. 1996, 244, Kyoto, Japan, 1966.

3. C. J. Summers and S. D. Smith, "Faraday Rotation in Indium Arsenide," *Proceedings of the Physical Society* **92**, 215, 1967.

4. C. J. Summers, P. G. Harper and S. D. Smith, "Polaron Coupling and Linewidth Studies of Cyclotron Resonance Absorption in InSb in the Faraday Configuration," *Solid State Communications* **5**, 615, 1967.

5. C. J. Summers, R. Dennis, B. S. Wherrett, P. G. Harper and S. D. Smith, "Resonant-Polaron-Coupling Investigation by a Study of Linewidths, Strengths, and Frequencies of Cyclotron Resonance and Magnetic Impurity Absorption in InSb," *Physical Review* **170**, 755, 1968.

6. C. J. Summers, R. B. Dennis, S. D. Smith and C. W. Litton, "Infrared Magneto-Optical Studies of Linewidth Anomalies Caused by Resonant Polaron Coupling to Magnetic States in Polar Semiconductors," *Proceedings of the 9th International Conference on Physics of Semiconductors*, Moscow, Russia, 1029, 1968.

7. C. J. Summers, R. Dingle and D. E. Hill, "Far Infrared Donor Absorption and Photoconductivity in Epitaxial n-Type GaAs," *Physical Review* **B1**, 1603, 1970.

8. J. Barker, Jr. and C. J. Summers, "Infrared Dielectric Function of CdS," *Journal of Applied Physics* **41**, 3552, 1970.

9. R. B. Dennis, S. D. Smith and C. J. Summers, "Oscillatory Non-Resonant Interband Faraday Rotation in InSb and PbTe - A New Magneto-Optical Effect," *Proceeding of the Royal Society* **A321**, 303, 1971.

10. J. F. Black, C. J. Summers and B. Sherman, "Spatial Variation of Radiative Recombination in GaAsP Wafer Revealed by Photoluminescence Image," *Applied Physics Letters* **19**, 28, 1971.

11. J. D. Taynair, R. Dietch, C. J. Summers and J. Black, "Luminescent Properties of AlGaAs Grown By Transient Mode Liquid Epitaxy," *Journal of Electronic Materials* **1**, 213, 1972.

12. J. F. Black, C. J. Summers and B. Sherman, "Scanned Laser Microscope for Photoluminescence Studies," *Applied Optics* **11**, 1553, 1972.

13. C. J. Summers and J. C. Miklosz, "Photoluminescence of Ion-Implantation-Damaged n-Type GaAs," *Journal of Applied Physics* **44**, 4653, 1973.

14. C. J. Summers, J. F. Black and F. J. Reid, "Evaluation of Processes Used to Fabricate Light-Emitting Diodes," *Journal of Electronic Materials* **2**, 387, 1973.

15. C. J. Summers and S. Zwerdling, "Material Characterization and Ultimate Performance Calculations of Compensated n-Type Silicon Bolometer Detectors at Liquid Helium Temperatures," *IEEE Transactions Microwave Theory and Techniques* **22**, 1009, 1974.

16. D. A. Nelson, C. J. Summers and C. R. Whitsett, "Phase Diagram and Crystal Growth of Pseudobinary HgSe-CdSe Alloys," *Journal of Electronic Materials* **6**, 507, 1977.

17. D. A. Nelson, J. G. Broerman, C. J. Summers and C. R. Whitsett, "Electron Transport in the $Hg_{1-x}Cd_xSe$ Alloy System," *Physical Review* **B18**, 1658, 1978.

18. C. J. Summers, D. A. Nelson, J. G. Broerman and C. R. Whitsett, "Electronic Properties of Zincblende-Structure Semiconducting $Hg_{1-x}Cd_xSe$ Alloys," *Proceedings of the 14th International Conference on Physics of Semiconductors*, Edinburgh, Scotland, 265, 1978.

19. R. L. Levey, D. L. Fanter and C. J. Summers, "Spectroscopic Evidence for Mechanochemical Effects of Moisture on Epoxy Resins," *Journal of Applied Polymer Science* **24**, 1643, 1979.

20. C. J. Summers and J. G. Broerman, "Optical Absorption in $Hg_{1-x}Cd_xSe$ Alloys," *Physical Review* **B21**, 559, 1980.

21. S. L. Lehoczky, F. R. Szofran, C. J. Summers and B. G. Martin, "Electrical Characterization of $Hg_{1-x}Cd_xTe$ Alloys," *Proceedings of the Symposia on Material Processing in the Reduced Gravity of Space*, Boston, Massachusetts, 421, 1981.

22. C. J. Summers, "Assessment of Mercury Cadmium Telluride Materials Development," *NMAB Publications* **377**, National Academy of Sciences, Washington, D.C., 1982**.**

23. C. J. Summers, E. L. Meeks and N. W. Cox, "Molecular Beam Epitaxial Growth of CdTe, HgTe and $Hg_{1-x}Cd_xTe$ Alloys," *Journal of Vacuum Science & Technology* **B2**, 224, 1984.

24. C. J. Summers, B. Darling and B. G. Martin, "Computer Modeling of Carrier Transport in (Hg,Cd)Te Photodiodes," *Journal of Applied Physics* **59**, 2457, 1986.

25. C. J. Summers and K. F. Brennan, "Variably Spaced Superlattice Energy Filter: A New Device Concept for High Energy Electron Injection," *Applied Physics Letters* **48**, 806, 1986.

26. J. D. Benson, B. K. Wagner, A. Torabi and C. J. Summers, "Surface Stoichiometry and Reaction Kinetics of Molecular Beam Epitaxially Grown (001) CdTe Surfaces," *Applied Physics Letters* **49**, 1034, 1986.

27. K. F. Brennan and C. J. Summers, "The Variably Spaced Superlattice Electroluminescent Display: A New High Efficiency Electroluminescence Scheme," *Journal of Applied Physics* **61**, 5410, 1987.

28. C. J. Summers, K. F. Brennan, H. D. Rogers and B. K. Wagner, "The Variably Spaced Superlattice Energy Filter," *Superlattices and Microstructures* **3**, 147, 1987.

29. K. F. Brennan and C. J. Summers, "Theory of Resonant Tunneling in a Variably Spaced Multiquantum Well Structure: An Airy Function Approach," *Journal of Applied Physics* **61**, 614, 1987.

30. K. F. Brennan and C. J. Summers, "The Variably Spaced Superlattice Energy Filter Quantum Well Avalanche Photodiode: A Solid-State Photomultiplier," *IEEE J. Quantum Electron* **QE-23**, 320, 1987.

31. C. J. Summers and K. F. Brennan, "New Resonant Tunneling Superlattice Avalanche Photodiode Structure for Long-Wavelength Infrared Detection," *Applied Physics Letters* **51**, 276, 1987.

32. B. K. Wagner, J. D. Oakes and C. J. Summers, "Molecular Beam Epitaxial Growth and Characterization of ZnTe and CdTe on (001) GaAs," *Journal of Crystal Growth* **86**, 296, 1987.

33. J. D. Benson and C. J. Summers, "Surface Nucleation Kinetics of Molecular Beam Epitaxially Doped (001) and (111) CdTe," *Journal of Crystal Growth* **86**, 354, 1987.

34. K. F. Brennan, Y. Wang, C. J. Summers and A. Torabi, "The Electron Ionization Rate in Multilayered Semiconductor Structures," *Superlattices and Microstructures* **3**, 673, 1987.

35. C. J. Summers, K. F. Brennan, A. Torabi, H. M. Harris and J. Comas, "Resonant Tunneling Studies of Variable Spaced Multiple Quantum Well Structures in the AlGaAs System," *J. de Physique* **48**, C5-457, 1987.

36. R. G. Benz, P. C. Huang, S. R. Stock and C. J. Summers, "Molecular Beam Epitaxial Growth and Structural Characterizations of ZnS on (001) GaAs," *Journal of Crystal Growth* **86**, 303, 1988.

37. C. J. Summers, K. F. Brennan, A. Torabi, H. M. Harris, "Resonant Tunneling and Negative Differential Resistance in a Variably Spaced Superlattice Energy Filter," *Applied Physics Letters* **52**, 132, 1988.

38. A. Rohatgi, S. A. Ringel, J. Welch, E. Meeks, K. Pollard, A. Erbil, C. J. Summers, P. V. Meyers and C. H. Kiu, "Growth and Characterization of CdMnTe and CdZnTe Polycrystalline Thin Films for Solar Cells,"

Solar Cells **24**, 185, 1988.

39. S. Ben Amor, K. P. Martin, J. J. L. Rascol, R. J. Higgins, A. Torabi, H. M. Harris and C. J. Summers, "Transverse Magnetic Field Dependence of the Current-Voltage Characteristics of Double-Barrier Quantum Well Tunneling Structures," *Applied Physics Letters* **53**, 2540, 1988.

40. P. C. Huang, S. R. Stock, A. Torabi and C. J. Summers, "Characterization of Structural Inhomogeneities in GaAs/AlGaAs Superlattice," *Proceedings of 38th Conference on Applications of X-Ray Analysis*, Denver, Colorado, July 1989.

41. J. D. Benson, D. Rajavel, B. K. Wagner, R. Benz II and C. J. Summers, "Properties of Undoped and Sb-Doped CdTe Surfaces Prepared by Conventional and Photon-Assisted Molecular Beam Epitaxy," *Journal of Crystal Growth* **95**, 543, 1989.

42. A. Torabi, R. B. Haugen, H. M. Harris and C. J. Summers, "Si Planar Doping of GaAs," *Journal of Vacuum Science & Technology* **A7**, 1329, 1989.

43. B. K. Wagner, R. G. Benz II and C. J. Summers, "A New Fast-Response Hg-Vapor Source for HgCdTe MBE Growth," *Journal of Vacuum Science & Technology* **A7**, 295, 1989.

44. J. D. Benson and C. J. Summers, "Nucleation Kinetics of Molecular Beam Epitaxially Grown (001) ZnTe and CdTe Surfaces," *Journal of Applied Physics* **66**, 5367, 1989.

45. J. J. L. Rascol, S. Ben Amor, K.P. Martin, R. J. Higgins, A. Celeste, J.C. Portal, A. Torabi, H. M. Harris and C. J. Summers, "Magneto-Spectral Analysis of Tunneling Processes in a Double Quantum Well Tunneling Structure," *Physics Review* **B41**, 3733, 1990.

46. D. Rajavel, F. Mueller, J. D. Benson, B. K. Wagner, R. G. Benz II and C. J. Summers, "In-situ Calibration of Growth Surface Temperature for Molecular Beam Epitaxy of CdTe," *Journal of Vacuum Science & Technology* **A8**, 192, 1990.

47. D. Rajavel, F. Mueller, J. D. Benson, B. K. Wagner, R. G. Benz II and C. J. Summers, "In-situ Calibration of Growth Surface Temperature Measurement for Molecular Beam Epitaxial Growth of CdTe, ZnTe and $Cd_{1-x}Zn_xTe$ Alloys," *Journal of Vacuum Science & Technology* **A8**, 1002, 1990.

48. G. S. Tompa, C. J. Summers, W. L. Ahlgren and S. M. Johnson, "MOCVD Growth of Novel, Epitaxial, II-VI Solar Cell Structures," *International Conference on Electronic Materials*, New Jersey, June 1990.

49. R. G. Benz II, B. K. Wagner and C. J. Summers, "Growth of CdTe, and Hg-based Alloys by Chemical Beam Epitaxy," *Journal of Vacuum Science & Technology* **A8**, 1020, 1990.

50. R. G. Benz II, B. K. Wagner, D. Rajavel and C. J. Summers, "Chemical Beam Epitaxy of CdTe, HgTe and HgCdTe," *Journal of Crystal Growth* **111**, 725, 1991.

51. K. Wagner, D. Rajavel, R. G. Benz II and C. J. Summers, "Characterization of CdTe and $Hg_{1-x}Cd_xTe$ Grown by Chemical Beam Epitaxy," *Journal of Vacuum Science & Technology* **B9**, 1656, 1991.

52. D. Rajavel, B. K. Wagner, K. Maruyama, A. Conte-Matos and C. J. Summers, "Determination and Calibration of the Flow Characteristics of a Pressure Controlled Vapor Source for Gas Source Doping," *Materials Research Conference*, Anaheim, California, May 1991.

53. K.H. Chiang, C. J. Summers and R. P. Kenan, "Direct Measurement of the Effective Refractive Indices of

GaAs/AlGaAs Slab Waveguides: A New Technique," *Applied Optics* **30**, 2570, 1991.

54. D. Rajavel, K. Maruyama, A. Conte, R. G. Benz II and C. J. Summers, "Analysis and Calibration of the Flow Characteristics of a Pressure Controlled Vapor Source for Gas Source Doping," *Material Research Society Symposium Proceedings* **222**, 273, 1991.

55. C. J. Summers, B. K. Wagner, R. G. Benz II and D. Rajavel, "Metalorganic Molecular Beam Epitaxy of II-VI Materials," *The International Society For Optical Engineering Proceedings, Infrared and Optoelectronic Materials and Devices* **1512**, 170, 1991.

56. P. Aristin, A. Torabi, A. K. Garrison, H. M. Harris and C. J. Summers, "Evaluation of New Multiple Quantum Well Avalanche Photodiode Structures: the MQW, the Doped Barriers and Doped Quantum Well," Int. Symposium on GaAs and Related Compounds, Seattle, WA; *Inst. Physics Conference Series* **120**, 523, 1991.

57. C. J. Summers, B. K. Wagner, R. G. Benz II and D. Rajavel, "Chemical Beam Epitaxy of HgCdTe," *Semiconductor Science & Technology* **6**, C10-C14, 1991.

58. J. D. Benson, B. K. Wagner, R. G. Benz II and C. J. Summers, "Selected Area Epitaxial Growth of CdTe," *Journal of Vacuum Science & Technology* **B10**, 1415, 1991.

59. G. Tompa and C. J. Summers, "Metalorganic Chemical Vapor Deposition of ZnTe on GaAs," *Semiconductor Science & Technology* **10**, 903, 1992.

60. P. Aristin, A. Torabi, A. K. Garrison, H. M. Harris and C. J. Summers, "A New Doped Multiple Quantum Well Avalanche Photodiode, the Doped Barrier $Al_{0.35}Ga_{0.65}As$/GaAs Multiple Quantum Well Avalanche Photodiode," *Applied Physics Letters* **60**, 85, 1992.

61. D. Rajavel, A. Conte, B. K. Wagner, R. G. Benz II and C. J. Summers, "Properties of Gas-Source Iodine-Doped CdTe and HgCdTe Layers," *Journal of Vacuum Science & Technology* **B10**, 1432, 1992.

62. H.K. Chiang, R. P. Kenan and C. J. Summers, "Spurious Roots in Nonlinear Waveguide Calculations and a New Format for Nonlinear Waveguide Dispersion Equations," *IEEE Quantum Electron* **28**, 1756, 1992.

63. H.K. Chiang, C. J. Summers and R. P. Kenan, "The Analysis of a Novel Optical Two-State Switch," *IEEE Photonics Technology Letters* **4**, 368, 1992.

64. C. J. Summers, B. K. Wagner, R. G. Benz and D. Rajavel, "Chemical Beam/Gas Source Epitaxial Growth of HgCdTe," Invited, *Tenth Anniversary Issue of Chinese Journal of Infrared and Millimeter Waves* **11**, 368, 1992.

65. D. Rajavel and C. J. Summers, "Gas Source Iodine N-type Doping of Molecular Beam Epitaxially Grown CdTe," *Appl. Physics Lett.* **60**, 2231, 1992.

66. H.K. Chiang, R. P. Kenan, N.F. Hartman and C. J. Summers, "Optical Alignment and Tilt-Angle Measurement Technique Based on Lloyd's Mirror Arrangement," *Optical Letters* **17**, 1024, 1992.

67. N. C. Giles, J. Lee, D. Rajavel and C. J. Summers, "Photoluminescence of n-Type CdTe:I Grown by Molecular Beam Epitaxy," *J. of Appl. Physics* **73**, 4541, 1993.

68. N. C. Giles, J. Lee, D. Rajavel and C. J. Summers, "Photoluminescence of Type CdTe:I Grown by Molecular Beam Epitaxy," *Journal of Applied Physics* **73**, 4541, 1993.

69. R. G. Benz II, B. K. Wagner, A. Conte and C. J. Summers, "CdTe and HgCdTe Surface Growth Kinetics for Molecular and Metalorganic Molecular Beam Epitaxy," *J. Electronic Materials* **22**, 815, 1994.

70. Z. Yu, S. G. Hofer, N. C. Giles, T. H. Myers, D. Rajavel and C. J. Summers, "Interpretation of Near Bandedge Photoreflectance Spectra from CdTe," Submitted to *Applied Physics Letters*, 1993.

71. D. Rajavel, A. Conte and C. J. Summers, "Pyrolysis Characteristics of Iodine Processors for Gas Source N-type Doping of II-VI Compounds," *Journal of Crystal Growth* **140**, 327, 1994.

72. K. Maruyama, R. G. Benz II, A. Conte-Matos, B. K. Wagner and C. J. Summers, "Gas Source Doping of Molecular Beam Epitaxially Grown CdTe Using Arsine," *Journal of Crystal Growth* **137**, 435, 1994.

73. J. Lee, N. C. Giles, D. Rajavel and C. J. Summers, "Room Temperature Band-Edge Photoluminescence from Cadmium Telluride," *Physical Review* **B49**, 1668, 1994.

74. J. Lee, N. C. Giles and C. J. Summers, "Above Band-Gap Photoluminescence from N-type CdTe:I Grown by Molecular Beam Epitaxy," *Physics Review* **B49**, 11459, 1994.

75. R. G. Benz II, A. Conte-Matos, B. K. Wagner and C. J. Summers, "Ethyliodide N-type Doping of $Hg_{1-x}Cd_xTe$ (x = 0.24) Grown by Metalorganic Molecular Beam Epitaxy," *Applied Physics Letters* **65**, 2836, 1994.

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D. PRESENTATIONS

Invited Presentations

1. C. J. Summers, W. Tong, B. K. Wagner and H. Menkara, "Low Temperature Process Development of SrS Electroluminescent Phosphors," *Society for Information Display*, San Diego, CA, May 2000.

2. W. Park and C. J. Summers, "Photonics - A Primer", Physics Colloquium, School of Physics, Georgia Institute of Technology, Atlanta, GA, Oct. 11, 2000.

3. ZnS-Based Photonic Crystals, W. Park, J. S. King, C. W. Neff, C. Liddell and C. J. Summers. Tenth International Conference on II-VI Compounds, Bremen, Germany, September 2001.

4. C. J. Summers, "Photonic Crystals" DARPA Workshop on Optical Materials for Future Devices and Systems", Tampa, FL, 10-12 September 2001.

5. C. J. Summers, “New Concepts in Photonic Crystals”, Department of Materials Science, Seoul National University, Seoul, Korea, Nov. 22, 2001.

6. C. J. Summers, Recent Developments in Emissive Displays Phosphor, PPG, Pittsburgh, April 2002.

7. C.J. Summers, J. S. King & W. Park “New Phosphor and Material Structures for Displays” Proceedings: Second International Meeting on Information Display, Daegu, Korea 2002.

8. C. J. Summers, “Active and Emissive Photonic Crystal Nano-Architectures” 6th Mediterranean Workshop and Topical Meeting “Novel Optical Material and Applications” Cetraro, Italy. June 8 – 13, 2003

9. C. J. Summers, “Solid State Lighting: Diode Phosphors, Third International Conference on Solid State Lighting, San Diego, SPIE 48th Annual Meeting “International Symposium on Optical Science & Technology” California, 6th August, 2003.
10. C. J. Summers, W. Park and I. C. Khoo, “Novel Photonic Architectures: Liquid Crystal Infiltrated Photonic Crystals”, SPIE, August 3-10th 2003, San Diego, CA.

11. C. J. Summers, “Emissive and Active Photonic Crystals” University of Rochester, 12th November 2003

12. C. J. Summers, J.S. King, D. Heineman, C. W. Neff, and E. Graugnard, “Atomic Layer Deposition in Porous Materials: 3D Photonic Crystals”, 12th International Conference on Solid Films and Surfaces, June 21-25 2004, Congress Center, Hamamatsu, Japan.

13. C.J. Summers, C.W. Neff, B.K. Wagner, and W. Park, “Tunable Photonic Crystal Structures (Invited Paper),” in Tuning the Optical Response of Photonic Bandgap Structures, 48th Annual Meeting of SPIE, Denver, Colorado, 4-5 August 2004.

14. C. J. Summers, J.S. King, D. Heineman, C. W. Neff and E. Graugnard “Atomic Layer Deposition in Porous Materials: 3D Photonic Crystals:, University of Colorado, Boulder, Colorado, 6th August 2004.

15. Plasma Display Phosphors: Past, Present and Future, C J. Summers, *Asia Display/IMID’04* Exhibition & Convention Center, Daegu, Korea, August 23-27, 2004.

16. C. J. Summers, New Photonic Crystal Structures: The Dynamic, Static and Hybrid Superlattices”, LG-Philips – LCD, Kumi-city, Kyungbuk, Korea, August 25th 2004.

17. C.J. Summers “Novel Photonic Architectures: Liquid Crystal Infiltrated Photonic Crystals” SPIE 49th Annual Meeting “International Symposium on Optical Science & Technology” Tunable Photonic Crystal, Denver Convention Center, USA, August 3 – 8, 2004.

18. “Photonic Crystal Superlattices in Electro-Optic Slab Waveguides”, C. W. Neff & C. J. Summers, SPIE 49th Annual Meeting “International Symposium on Optical Science & Technology” Tunable Photonic Crystal, Denver Convention Center, USA, August 3 – 8, 2004.

19. E. Graugnard, J. S. King, D. Heineman, and C. J. Summers, “Atomic Layer Deposition for Photonic Crystal Devices, International Conference on Atomic Layer Deposition 2004, August 16 – 18, 2004.

20. Z. T. Kang, Y. Liu, B. K. Wagner, R. Gilstrap, M. Liu, and C. J. Summers, “Synthesis and Characterization of Mn^{2+} Doped Zn_2SiO_4 Phosphor Films by Combustion CVD Method”

21. R. Gilstrap, H. Rao, B. K. Wagner and C. J. Summers “Nano SrS Phosphors for Lighting and Display Applications”

22. C. J. Summers, “Active and Emissive Photonic Crystals” Electrical & Computer Engineering Seminar, University of Charlotte, May 2, 2005.

23. C. J. Summers, E. Graugnard, D. Gaillot and J. S. King, "Luminescent and Tunable 3D Photonic Crystal Structures," 7th Mediterranean Workshop and Topical Meeting Novel Optical Materials and Applications, Cetraro, Italy, May 30th - June 3rd, 2005.

24. C. J. Summers, E. Graugnard, J. S. King, "ALD: A new tool for photonic crystal fabrication," Invited, Atomic Layer Deposition 2005, San Jose, CA, August 8-10, 2005.

25. D. Gaillot, E. Graugnard, J. S. King, and C. S. Summers, "Highly Tunable Photonic Band Gaps in Non-Close-Packed Inverse Shell Opals,", IEEE-LEOS Annual Meeting, 25 October 2005, San Diego, California.

26. C. J. Summers, C. W. Neff and T. Yamashita, "Photonic Crystals with Tunable Refraction and Dispersion," SPIE 50th Annual Meeting, 31 July - 5 August, 2005, San Diego, California.

27. C. J. Summers, C. W. Neff and T. Yamashita, "Novel 2D Photonic Crystals Structures," First International Symposium on Optoelectronics in Optics Valley of China, Wuhan, China, 2-4 November 2005.

28. C. J. Summers, C. W. Neff, T. Yamashita and C. P. Wong, "Photonic Crystal Sensors," 6th East Asia Conference on Chemical Sensors, Guilin, China, 6-9 November 2005.

Contributed Presentations

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9. C. J. Summers, "The Growth and Characterization of HgCdSe," Invited Seminar, *Air Force Materials Laboratories*, April 1977.

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83. C. J. Summers, "Metalorganic Molecular Beam Epitaxy of II-VI Materials," Invited, *International Congress on Optical Science and Engineering*, The Hague, Netherlands, March 1991.

84. K. H. Chiang, C. J. Summers and K. P. Kenan, "A New Technique to Measure the Effective Refractive Indices of Semiconductor Slab Waveguides," *Integrated Photonics Research Topical Meeting*, Monterey, California, April 1991.

85. C. Chiang, K. P Kenan and C. J. Summers, "New Format for the Dispersion Equation for Nonlinear Waveguides," *Optical Society of America Annual Meeting*, San Jose, California, November 3-8, 1991.

86. C. Chiang, K. P. Kenan and C. J. Summers, "Novel Optical Waveguide Beamsteering Device," *Optical Society of American Annual Meeting*, San Jose, California, November 3-8, 1991.

87. C. J. Summers, B. K. Wagner and R. G. Benz II, "Recent Advances in Metalorganic Molecular Beam Epitaxy of HgCdTe," Invited, *International Symposium on Optics, Imaging and Instrumentation*, San Diego, California, July 1993.

88. M. A. Gross, T. K. Wagner, R. P. Kenan and C. J. Summers, "Enhanced Performance of AlGaAs/GaAs Asymmetric Fabry-Perot Reflection Modulators," *Optical Society Of America Annual Meeting*, Spatial Light Modulators and Applications, 1993.

89. C. J. Summers, "Phosphor Technology Center of Excellence: Research, Education and Industrial Interactions," Invited, *Society for Information Display Manufacturing Conference*, San Francisco, California, January 11-13, 1994.

90. C. J. Summers, "The Phosphor Technology Center of Excellence, Research, Education Industrial Interactions," Invited, *1994 Display Manufacturing Technology Conference*, San Francisco, California, February 1994.

91. J. W. Tomm, K. H. Herrmann, C. J. Summers and T. K. Tran, "Excitonic effects and Luminescence Properties of Narrow Gap $Hg_{1-x}Cd_xTe$," *International Conference on Excitonic Processed in Condensed Matter*, EXCON, Darwin, Australia, 1994.

92. N. C. Giles, J. Lee, T. K. Tran, J. W. Tomm and C. J. Summers, "Photoluminescence and Raman Studies of High Quality CdTe:I Epilayers," *1994 Workshop on the Physics and Chemistry of Mercury Cadmium Telluride and other IR Materials*, October 4-6, 1994.

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94. C. J. Summers, "Metalorganic Molecular Beam Epitaxy of HgCdTe and Related II-VI Semiconductor Systems," Seminar, *Materials Seminar Series, Georgia Institute of Technology*, Atlanta, Georgia, April 1994.

95. C. J. Summers, "Optical Properties of Metalorganic Molecular Beam Epitaxially Grown CdTe:I and HgCdTe:I and Related II-VI Semiconductor Systems," *Humbolt-Universität zu Berlin*, Berlin, Germany, June 1994.

96. C. J. Summers, "Phosphor Technology Center of Excellence," Invited, *IS&T/SPIE Symposium on Electronic Imaging Sciences and Technology*, San Jose, California, February 6-10, 1994.

97. C. J. Summers, "Phosphor Technology Center of Excellence," Invited, *OIDA-USDC-DOE Flat Panel Display Luminescent Materials Workshop*, Pleasanton, California, March 29-30, 1994.

98. C. J. Summers, "The Phosphor Technology Center of Excellence, Flat Panel Display Strategic Forum: Creating an U.S. Industry," Invited, *University of Michigan*, Michigan, November 1994.

99. B. K. Wagner, J.M. Jacobsen, W. Tong, S. Yang, F. Zhang, T. K. Tran, X. Shen, W.J. Lackey, J. Lewis and C. J. Summers, "Thin Film Phosphors for Flat Panel Displays," Invited, *1995 Display Manufacturing Technology*, Santa Clara, California, January 31-February 2, 1995.

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103. C. J. Summers, "Advances in Phosphor Materials," Invited, *Motorola 3rd Annual Worldwide Display Technology Symposium*, Ft. Lauderdale, FL, February 1996.

104. C. J. Summers, "Flat Panel Display Materials," Tutorial presented with J. Kanicki, Invited, *Materials Research Society 1996 Spring Meeting*, San Francisco, California, April 8-12, 1996.

105. C. J. Summers, "Phosphors for Emissive Flat Panel Displays," Invited, *98th Annual Meeting & Exposition of the American Ceramic Society*, Indianapolis, IN, April 14-17, 1996.

106. C. J. Summers, "Current Research Trends in Display Phosphors," Invited, *Third International Display Workshops*, Kobe, Japan, November 27-29, 1996.

107. C. J. Summers, "Recent Research Trends in Display Phosphors," Invited Seminar, *Phosphor Society of Japan*, Tokyo, Japan, November 30, 1996.

108. C. J. Summers, "Phosphor Technology Center of Excellence," DARPA HDS, Invited, *Information Exchange Meeting*, Arlington, VA, March 24-26, 1997.

109. C. J. Summers, "The Phosphor Technology Center of Excellence," Seminar, *3M Corporation*, St. Paul, Minnesota, April 24-25, 1997.

110. C. J. Summers, "Phosphors for Flat Panel Displays," Tutorial, Invited, *Society for Information Display 1997 International Symposium, Seminar & Exhibition*, Boston, MA, May 11-16, 1997.

111. C. J. Summers, "Phosphors for Field Emission and Plasma Displays," Invited, *International Conference on Plasma Science*, San Diego, California, May 19-22, 1997.

112. C. J. Summers, "Phosphors for Field Emission Displays," Invited, *10th International Vacuum Microelectronics Conference*, Kyongju, Korea, August 17-21, 1997

113. C. J. Summers, "Field Emission and Plasma Display Phosphors," Invited Seminar, *Samsung Display Devices*, Seoul, Korea, August 22, 1997.

114. C. J. Summers, "*In situ* Characterization and Defects in Thin Film Phosphors," Invited, *7th International Conference on Defect Recognition and Image Processing in Semiconductors*, Templin, Germany, September 7-10, 1997.

115. C. J. Summers, "Low Voltage Phosphors for Field Emission Displays," Invited Seminar, *LETI Research Laboratories*, Grenoble, France, September 11, 1997.

116. C. J. Summers, "Low Voltage Cathodoluminescent Phosphors," Invited, Symposium on Field Emission Displays, *17th International Display Research Conference*, Toronto, Canada, September 15-19, 1997.

117. C. J. Summers, "Flat-Panel Display Research within the Phosphor Technology Center of Excellence," Invited Seminar, *University Microelectronics Seminar, Georgia Institute of Technology*, Atlanta, Georgia, October 15, 1997.

118. C. J. Summers, "Phosphors Session Overview," Invited, *Defense Advanced Research Projects Agency High Definition Systems Information Exchange Conference*, March 22-25, 1998.

119. C. J. Summers and B. K. Wagner, "The Role of Surface Modification and Coating in Improving Phosphor Performance", Invited, *18th International Display Research Conference/Asia Display '98*, Seoul, Korea, September 28-October 1, 1998.

120. C. J. Summers, "Recent Progress in the Development of Full Color SrS-Based Electroluminescent Phosphors," Invited, *International Conference on II-VI Semiconductor Materials*, Nagoya, Japan, November 1999.

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137. C. M. Liddell and C. J. Summers, "Non-Spherical ZnS Colloidal Building Blocks for Diamond-Analog Photonic Crystal Structures", Materials Research Society Symposium, San Francisco, CA, Apr. 21-25, 2003

138 T. Yamashita, C. J. Summers, "Design and Simulation of Novel Optoelectronic Interconnect using Photonic Crystal Virtual Waveguide with Robust Fabrication and Misalignment Tolerances," submitted to 54th Annual Electronic Components and Technology Conference, Las Vegas, June 2004.

139 E. Mohammed, W. Park, W. Tong, S.R. Stock, and C.J. Summers, "Luminescent Properties of $Sr_xCa_{1-x}S$:Cu," APS March Meeting, Minneapolis, March 24, 2000.

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143 W. Park and C. J. Summers, "ZnS-Based Two-Dimensional Photonic Crystals", The First Georgia Tech Conference on Nanoscience and Nanotechnology, Atlanta, GA, Oct. 16-18, 2000.

144 C. Neff, J. King, W. Park, Z. L. Wang and C. J. Summers, "Template Directed Growth of Opal Photonic Structures of Silica and Polystyren Nanospheres", The First Georgia Tech Conference on Nanoscience and Nanotechnology, Atlanta, GA, Oct. 16-18, 2000.

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149 B. K. Wagner, P. Manigault, C. J. Summers and B. Cummings, “A Degradation Study of Sulfide Phosphors for Field Emission Displays”, 2002 International Conference on the Science and Technology of Emissive Displays and Lighting, September 23-26, 2002, Ghent, Belgium

150 W. Park and C. J. Summers, “Tunable Refraction in 2D Slab PC”, Photonic and Elecromagnetic Crystal Structures PECS-IV, October 28-31, 2002, Los Angeles, CA

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153 J. S. King, E. Graugnard, C. J. Summers, “Luminescent Composite 3D Photonic Crystals Fabricated by Atomic Layer Deposition.” (Poster) International Symposium on Photonic and Electromagnetic Crystal Structures V, 7- 11, Kyoto, Japan, March 2004.

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155 M. H. Kane, A. Asghar, C. R. Vestal, Z. J. Zhang, C. J. Summers, T. Steiner, I. T. Ferguson, M. Strassburg, N. Dietz, D. Azamat, U. Haboeck, A. Hoffman, and W. Gelhoff, "MOCVD growth and characterization of Multifunctional III-Nitride Nanostructures," presented at 1st US-Korea Workshop on Nanoelectronics, Seoul, South Korea, May 2004.

156 M. H. Kane, V. Rengarajan, K. Shalini, C. R. Vestal, A. M. Payne, Z. J. Zhang, C. J. Summers, J. Nause, and I. T. Ferguson, "Magnetic properties of bulk Zn1-xMnxO and Zn1-xCoxO single crystals," presented at AFOSR Zinc Oxide Workshop, Maui, Hawaii, May 2004.

157 M. H. Kane, A. Asghar, C. R. Vestal, Z. J. Zhang, C. J. Summers, T. Steiner, I. T. Ferguson, M. Strassburg, N. Dietz, D. Azamat, U. Haboeck, A. Hoffman, and W. Gelhoff, "MOCVD growth and characterization of Multifunctional III-Nitride Nanostructures," presented at AFOSR Workshop on Nanoscale Issues in Nitride Semiconductors, Anchorage, AK, May 2004.

158 Yamashita, Tsuyoshi, Christopher Summers. "Design and Simulation of Novel Optoelectronic Interconnect Using Photonic Crystal Virtual Waveguide with Robust Fabrication and Misalignment Tolerances." Proceedings - Electronic Components and Technology Conference, May (2004).

159 Davy Gaillot, Wounjhang Park, Jeff King, Elton D. Graugnard and Christopher Summers “Experimental and Theoretical Investigations of 3D Inverted opals” Dijon Photonics Summer School – 21-25th June 2004. Poster presentation

160 M. H. Kane, V. Rengarajan, K. Shalini, C. R. Vestal, A. M. Payne, Z. J. Zhang, C. J. Summers, J. Nause, and I. T. Ferguson, "Single Crystals of Zn1-xMnxO and Zn1-xCoxO for Spintronic Applications," presented at TMS Electronic Materials Conference, Notre Dame, IN, June 2004.

161 M. Strassburg, N. Dietz, D. Azamat, U. Haboeck, A. Hoffman, W. Gelhoff, M. H. Kane, A. Asghar, A. M. Payne, C. R. Vestal, Z. J. Zhang, C. J. Summers, and I. T. Ferguson, "Incorporation of Manganese on lattice site in MOCVD-grown Ga1-xMnxN," presented at TMS Electronic Materials Conference, Notre Dame, IN, June 2004.

162 M. H. Kane, A. Asghar, C. R. Vestal, S. Gupta, D. Mehta, A. M. Payne, M. Strassburg, J. Senawiratne, N.Dietz, Z. J. Zhang, C. J. Summers, and I. T. Ferguson, "Comparison of GaMnN grown by ion implantation and metalorganic chemical vapor deposition," presented at International Workshop on Nitride Semiconductors, Pittsburgh, PA, July 2004.

163 C.W. Neff and C.J. Summers, “Photonic Crystal Superlattices in Electro-Optic Slab Waveguides,”in Tuning the Optical Response of Photonic Bandgap Structures, 48th Annual Meeting of SPIE, Denver, Colorado, 4-5 August 2004.

164 E. Graugnard, J.S. King, D. Heineman, C.J. Summers,” Atomic layer deposition for photonic crystal devices.” AVS/BALD Atomic Layer Deposition Conference, Helsinki, Finland, August 16-18th (2004).

165 W. Tong, M. Harris, B.K. Wagner, C.J. Summers, Z.C. Feng, and C.C. Yang, “Thin Layer GaN Growth on Si Substrates Using Pulse Source Injection Molecular Beam Epitaxy” EL Conference, Toronto, Canada, 20- 23rd September 2004

166 Z. T. Kang, Y. Liu, B. K. Wagner, R. Gilstrap, M. Liu, and C. J. Summers, “Synthesis and Characterization of Mn^{2+} Doped Zn_2SiO_4 Phosphor Films by Combustion CVD Method”, Proceedings of 12th International Workshop on Inorganic and Organic Electroluminescence & 2004 International Conference on the Science and Technology of Emissive Displays and Lighting, September.20-23rd, 2004, Toronto, Canada.

167 R. Gilstrap, R. Haibo, B. K. Wagner, Z. T. Kang, and C. J. Summers, “Nano SrS Phosphors For Lighting And Display Applications”, Proceedings of 12th International Workshop on Inorganic and Organic Electroluminescence & 2004 International Conference on the Science and Technology of Emissive Displays and Lighting, September 20-23rd , 2004, Toronto, Canada.

168 M. H. Kane, V. Rengarajan, C. R. Vestal, K. Shalini, J. Nause, J. Z. Zhang, C. J. Summers, and I. T. Ferguson, "Another spin: can room temperature ferromagnetism be obtained in wide bandgap materials," presented at Conference on Quantum Electronics and Photonics, Glasgow, Scotland, September 2004.

169 M. H. Kane, V. Rengarajan, C. R. Vestal, Q. Song, K. Shalini, E. Wornyo, Z. J. Zhang, C. J. Summers, J. Nause, and I. T. Ferguson, "Structural, Optical, and Magnetic Properties of Single Crystals of ZnO:TM (TM=Mn, Co, Fe)," presented at 3rd International Workshop on ZnO, Sendai, Japan, October 2004 (poster).

170 C.W. Neff and C.J. Summers, “Photonic Crystal Superlattices,” Proceedings of the 17th Annual Meeting of the IEEE Lasers and Electro-Optics Society, Rio Grande, Puerto Rico, 7- 11th November 2004.

171 “ZnO Nanorods Imbedded TiO2 2D Photonic Crystal through a Bottom-up Process”, X. D. Wang, C. Neff, E. Graugnard, Y. Ding, J. S. King, Z. L. Wang and C. J. Summers, 2004 MRS Fall Meeting, November 29-December 3, 2004, Boston, MA

172 J. S. King, D. Gaillot, T. Yamashita, C. Neff, E. Graugnard, and C. J. Summers, “Complex, 3D Photonic Crystals Fabricated by Atomic Layer Deposition,” MRS Fall Meeting, Boston, MA, November 29-December 3, 2004.

173 M. H. Kane, A. Asghar, M. Strassburg, Q. Song, A. M. Payne, C. J. Summers, Z. J. Zhang, N. Dietz, and I.T. Ferguson, "Impact of Manganese incorporation on the structural and magnetic properties of MOCVDgrown Ga1-xMnxN," presented at Materials Research Society Fall Meeting, Boston, MA, November 29-December 3, 2004.

174 M. Strassburg, J. Senawiratne, C. Hums, N. Dietz, M. H. Kane, A. Asghar, C. J. Summers, U. Haboeck, A. Hoffman, D. Azamat, W. Gelhoff, and I. T. Ferguson, "Optical and Structural Investigations on Mn ion states in MOCVD-grown GaMnN," presented at Materials Research Society Fall Meeting, Boston, MA, November 29-December 3, 2004.

175 M. H. Kane, M. Strassburg, I. T. Ferguson, and C. J. Summers, "Wide-bandgap diluted magnetic semiconductors as a future platform for spintronic sensors," The 5th Georgia Tech Annual Conference on Nanoscience and Nanotechnology, Atlanta, GA, November 2004.

176 E. Graugnard, J.S. King, X.D. Wang, D. Heineman, Z.L. Wang, C.J. Summers, “Atomic layer deposition for precise, large-scale nanostructure fabrication.” The 5th Georgia Tech Conference on Nanoscience and Nanotechnology, Atlanta, GA., November 2004.

177 J. S. King, E. Graugnard, O. M. Roche, D. N. Sharp, C. J. Summers, R. G. Denning and A. J. Turberfield, (Oral) "Infiltration and Inversion of Holographically-Defined Polymer Photonic Crystal Templates using Atomic Layer Deposition," International Symposium on Photonic and Electromagnetic Crystal Structures VI, Crete, June 2005.

178 Z. T. Kang, B. Arnold, B. K. Wagner and C. J. Summers, "Red luminescence from Si quantum dots embedded in SiO_x films grown with controlled stoichiometry," SPIE 50th Annual Meeting, San Diego, California, 31 July - 5 August, 2005.

179 Z. T. Kang, H. Menkara, B. K. Wagner and C. J. Summers, R. Durst, Y. Diawara, G. Mednikova and T. Thorson, "Oxygen Doped ZnTe Phosphors for Synchrotron X-Ray Imaging Detectors," U.S. Workshop on the Physics and Chemistry of II-VI Materials, Cambridge, MA, September 20-22, 2005.

180 C. W. Neff, T. Yamashita and C. J. Summers, "Refraction and dispersion in non-linear photonic crystal superlattices," IEEE-LEOS Annual Meeting, Sydney, Australia, October 2005.

181 D. Gaillot, E. Graugnard, J. S. King, and C. S. Summers, "Highly Tunable Photonic Band Gaps in Non-Close-Packed Inverse Shell Opals," IEEE-LEOS Annual Meeting, Sydney, Australia, 25 October 2005.

182 R. A. Gerhardt, R. Ou, S. Y. Patel, R. Gilstrap and C. J. Summers, “Fabrication and Photoluminescence of PMMA/Phosphor Nanocomposites” presented at Materials Research Society Fall Meeting, Boston, MA, November 29-December 3, 2005

.

E. OTHER SCHOLARLY ACCOMPLISHMENTS

Patents

1. “An Acoustical Charge Transport Imager,” Patent No. 5,162,885, W. D. Hunt, K. F. Brennan, and C. J.

Summers (October 1992)

2. "Tunnel Thin Film Electroluminescent Device", Patent No. 5,796,120, C. J. Summers and B. K. Wagner (1996)

3. W. Park and C. J. Summers, Rare Earth Oxide Coated Phosphors and a Process For Preparing the Same", US Patent No. 6,699,523

4. W. Park and C. J. Summers, "Oxide Based Quantum Cutter Method and Phosphor System", US Patent 6,669,867 B2

5. W. Park, K. Yasuda, B. K. Wagner and C. J. Summers, "A Novel Process for Thin Uniform and Continuous Y_2O_3 Coating on Sulfide Phosphors", Patent granted.

6. C. J. Summers & W. Park, "Photonic Crystal Structures", Patent Granted

7. W. Park, K. Yasuda, B. K. Wagner and C. J. Summers, "A Novel Process for Thin Uniform SiO_2 Coating on Sulfide Phosphors for Improved Low Voltage Cathodoluminescence Properties", Patent Applied For.

V. SERVICE

A. PROFESSIONAL CONTRIBUTIONS

Member, National Academy of Sciences Committee on HgCdTe	1980
Member, American Physical Society	1970-Present
Senior Member, Institute of Electrical and Electronic Engineers	1980-Present
Sigma Xi, Past Chapter President	1982-Present
Member, Society for Information Display	1985-Present
Member, Materials Research Society	1991-Present
Member, Optical Society of America	1991-Present
Session Chairman, "Physical Vapor Deposition," First International Conference on Processing of Electronic Materials	1987
Member, Advisory Committee of the International Conference on Millimeter Wave and Far Infrared Technology, Beijing, China	1989-93
Member, "Program Committee of the U.S. Workshop on the Physics and Chemistry of HgCdTe"	1990-1991
Session Chairman, "Materials Growth," U.S. Workshop on the Physics and Chemistry of HgCdTe	1991
Member, Program Committee of the U.S. Workshop on the Physics and Chemistry of HgCdTe	1992
Session Chairman, "Growth Techniques," U.S. Workshop on Physics and Chemistry of HgCdTe	1992
Session Chairman, "Fabrication and Process Technology," Sixth International Conference on Physics of Semiconductor Devices, New Delhi, India	1992
Panelist, "Future Directions in Microelectronics," Sixth International Conference on Semiconductor Devices, New Delhi, India	1991
Co-Chairman, U.S. Workshop on the Physics and Chemistry of HgCdTe	1993
Session Chairman, "Materials Growth," U.S. Workshop on the Physics and Chemistry of HgCdTe	1994
Panelist, "Flat Panel Display Strategic Forum: Creating an U.S. Industry," University of Michigan	1994

Infrastructure (Phosphor Technology and Materials) Session Chair, ARPA HDS Meeting, Arlington, VA 1995
Session Chair, Gordon Conference on the Chemistry of Electronic Materials Conference, Andover, NH 1995
Conference Chair - Program Committee, First International Conference on the Science & Technology of Display Phosphors, San Diego, CA 1995
Plenary Session Chair, First International Conference on the Science and Technology of Display Phosphors, San Diego, CA 1995
Session Co-Chair, Flat Panel Display Materials; Electroluminescent Phosphors and Nanocrystilline Phosphor Sessions, Materials Research Society, San Francisco, CA 1996
Member of Program Committee, 1996 U.S. Workshop on the Physics and Chemistry of II-VI Materials 1996
Conference Chair - Program Committee, Second International Conference on the Science & Technology of Display Phosphors, San Diego, CA 1996
Plenary Session Chair, Second International Conference on the Science & Technology of Display Phosphors, San Diego, CA 1996
Overseas Advisor, Third International Display Workshops, Kobe, Japan 1996
ARPA, HDS, Infrastructure (Phosphor Technology and Materials) Session Chair 1997
Program Committee Member, Society for Information Display 1997 International Symposium 1997
Session Co-Chair, Phosphors, Society for Information Display 1997 International Symposium 1997
Program Committee Member, 17th International Display Research Conference 1997
Member Program Committee 1997 U. S. Workshop on the Physics and Chemistry of II-VI Materials 1997
Conference Chair - Program Committee, Third International Conference on the Science & Technology of Display Phosphors, San Diego, CA 1997
Plenary Session Chair, Third International Conference on the Science and Technology of Display Phosphors, San Diego, CA 1997
Overseas Advisor and Co-Chair, LED and Inorganic EL Session, Fourth International Display Workshop, Nagoya, Japan 1997
Phosphor Session Chair, Defense Advanced Research Projects Agency High Definition Systems Information Exchange Conference, Washington, DC 1998
Chair - Program Committee, Fourth International Conference on the Science and Technology of Display Phosphors, Bend, OR 1998
Overseas Advisor, Fifth International Display Workshop 1998
Academic Committee International Chair, Society for Information Display 1994-2000
Chairman, Display Materials Session, International Conference on Advanced Materials IUMRS-ICAM, Beijing, China 1999
Program Advisory Committee, 1999 International Conference on Luminescence and Optical Spectroscopy of Condensed Matter 1999
Chair - Program Committee, Fifth International Conference on the Science and Technology of Display Phosphors, San Diego, CA 1999
Program Committee, Ninth International Conference on II-VI Compounds, Kyoto, Japan 1999
Chair, Sixth International Conference on Science and Technology of Display Phosphors, San Diego, CA 2000
Overseas Advisor, Seventh International Displays Workshops, Nagoya, Japan 2000
Program Committee, International Meeting on Inorganic and Organic Electrolumnternational Conference on Science and Technology of Emissive

Displays and Lighting, San Diego, Ca 2001
Overseas Advinescence, Japan 2000
International Program Committee, Tenth International Conference on
II-VI Compounds, Bremen, Germany 2001
Chair, 1st Iisor, Seventh International Displays Workshops, Nagoya, Japan 2001
International Program Committee, Tenth International Conference on
II-VI Compounds, Bremen, Germany 2001
Program Committee, International Meeting on Inorganic and Organic
Electroluminescence, Ghent, Belgium 2002
Chair, International Conference on Science and Technology of Emissive
Displays and Lighting, Ghent, Belgium 2002
Co-Chair, Global Phosphor Summit, Scottsdale, AZ, March19-21, 2003
International Program Committee, Eleventh International Conference
on II-VI Compounds, Niagara Falls, NY, October 2003
Chair, Global Phosphor Summit, Miami, USA, March 2004
Organizing Committee, Twelfth International Conference on Solid Films and
Surfaces, Hamamatsu, Japan 2004
Session Chair, Phosphors for Solid-State Lighting, SPIE Annual Meeting,
Denver, 4/5 August, 2004
Chair, Int. Conf. on Science & Technology of Emissive Displays
and Lighting, Toronto, Canada, September 2004
Session Chair, Nonlinear-Optical Materials, LEOS, Puerto Rico. November 2004
Chair, Global Phosphor Summit, San Diego, California, USA, March 2005
Session Chair, Novel Optical Materials & Applications, Italy, June 2005
Program Committee, Twelfth International Conference on II-VI Compounds,
Warsaw, Poland, September, 2005
International Program Committee, Phosphors & Emissive Materials, Korea,
18-20th September 2006
CHECK
Chair, Sixth International Conference on Science and Technology of Display
Phosphors, San Diego, CA 2000
Overseas Advisor, Seventh International Displays Workshops, Nagoya, Japan 2000
Program Committee, International Meeting on Inorganic and Organic
Electroluminescence, Hammamutsu, Japan 2000
Chair, First International Conference on Science and Technology on Emissive Displays
And Lighting, San Diego, CA 2001
International Program Committee, Tenth International Conference on II-VI
Compounds, Bremen, Germany 2001
Chair, Second International Conference on Science and Technology on Emissive Displays
And Lighting, Ghent, Belgium 2002
Co-Chair, Global Phosphor Conference, Phoenix, AZ, USA, 2003
International Program Committee, Eleventh International Conference on II-VI
Compounds, Niagara Falls, USA 2003
Co-Chair, Global Phosphor Conference, Miami, FL, USA, 2004
Organizing Committee, Twelve International Conference on Solid Films and Surfaces,
Hamamatsu, Japan 2004
Chair, Int. Conf. on Science & Technology of Emissive Displays and Lighting,
Toronto, Canada 2004
Applied Physics Letters Reviewer
Journal of Applied Physics Reviewer
Journal of Vacuum Science and Technology Reviewer
Journal of Electrochemical Society Reviewer

Journal of Society for Information Display Reviewer
NSF Proposal Reviewer
ARO Proposal Reviewer

B. CAMPUS CONTRIBUTIONS

Chairman, GTRI Research Awards Committee	1986
Member, Best Paper Selection Committee, Sigma Xi	1986
Chairman, Best Paper Selection Committee, Sigma Xi	1987
Member, GTRI Senior Technology Guidance Committee	1987-1989
Georgia Tech Sigma Xi Chapter	1988-1989
Member, Committee to Define Regents Researchers Award	1988
Georgia Tech Research Advisory Committee	1990-1993
Member, GTRI Academic Liaison Council	1992-1994
Member, Georgia Tech Research Coordination Committee	1993-1994
Member, Regents Researchers Award Committee	1988-Present
Member, Microelectronics Research Advisory Committee	1989-Present
Member, Georgia Tech Materials Committee	1991-Present
Member, Georgia Tech Materials Committee	1991-Present
Sigma Xi, Sustained Research Award Committee	2000
Member, MSE Committee	2001
Chair, Sigma Xi, Sustained Research Award Committee	2001
Member, MSE Service Committee	2001
Chair, Sigma Xi, Sustained Research Award Committee	2002
Chair, Faculty Search Committee, MSE	2002-2003
Chair/Member Faculty Search Committee, MSE	2004
Chair, PPR Committee for Prof. Sanders	2004
Promotion Committee for Yolande Berta	2004
Chair, Sigma Xi, Sustained Research Award Committee	2005
GT Awards Committee	2005
Chair, PPR Committee for Prof. Wong	2004
School Promotion Committee	2005-Present
School Graduate Committee	2005-Present

C. OTHER CONTRIBUTIONS

<u>Engineering Consulting</u>

McDonnell Douglas Corporation
LTV Corporation
GEC Avionics
NATO Consultant
Norwegian Telecommunications
EMCORE Inc.
NASA
DoE
Motorola
3M
Engelhard Corporation

VI. GRANTS AND CONTRACTS

A. AS PRINCIPAL AND CO-PRINCIPAL INVESTIGATOR

1. "Infrared Reflectivity of Mercury-Cadmium-Selenide," National Science Foundation, $25,000, 1976.

2. "Far-Infrared Mercury-Cadmium-Telluride Photoconductive Detectors," Air Force Office of Scientific Research, $157,000, 10/1/79-12/31/80.

3. "Computer Modeling of HgCdTe Photodiode," Aerojet ElectroSystems Inc., $15,000, for 6 months, 1983.
4. "Infrared Solar Cell for Space Power," NASA, $49,852, for one year, 1983, 6/28/83-1/31/85.

5. "Characterization Studies of CdS," General Dynamics Inc., $155,844, 4/30/83-5/30/84.

6. "Development of Molecular Beam Epitaxial Growth Techniques for HgCdTe Focal Plane Arrays," McDonnell Douglas Microelectronics Center, $187,879, for one year, 1/1/84-12/31/84.

7. "Molecular Beam Epitaxy of HgCdTe Alloys for Infrared Fiber Communications Systems," GTE Laboratories Inc., $134,996, for two years, 10/84-12/86.

8. "High Performance Photodiodes," Polaroid Corporation, $593,615, for 5 years, 4/1/85-6/30/91.

9. "Theoretical and Material Studies of Thin-Film Electroluminescent Devices," NASA, $183,490, for three years, 5/1/85-4/14/88.

10. "Optical Activated Switch," Battelle Institute, $89,795, for 12 months, 5/86-6/87.

11. "Cadmium and Zinc Telluride Based Thin Film Solar Cells," Solar Energy Research Institute, $451,624, for three years, 11/86-11/89.

12. "New Concepts for High Efficiency Energy Conversion: The Avalanche Heterostructure and Superlattice Solar Cell," Solar Energy Research Institute, $199,983, for three years, 6/1/87-7/31/90.

13. "CdTe Etching Studies and ME Growth of HgCdTe," LTV Corporation, $109,864, for 18 months, 6/1/87-12/31/88.

14. "HgCdTe Detector Material Studies," Aerojet ElectroSystems Company, $64,132, for 2 years, 10/87-11/89.

15. "Investigations of the Non-Linear Optical Properties of Superlattices and Modulation Doped Semiconductors," Wright Patterson Air Force Base, $70,140, for 9 months, 5/89-12/31/89.

16. "Advanced Superlattice Photodiode Infrared Detectors," $175,000, not loaded, Georgia Tech Research Institute, Internal Research Award, 1989-1992.

17. "Laser MBE Detector Development," Wright Development and Research Center, $516,142, for 3 years, 9/89-9/92.

18. "Optical Bistable Etalons," Rome Air Development Center, $110K for 2 years, 5/90-6/92.

19. "Quasi-Optical Power Combining for Millimeter Wave Devices," ARO $920K for three years, 5/91-2/94.

20. "An Acoustical Charge Transfer Scheme for High Definition TV," NASA/ARPA, $10M for 5 years.

21. “New Materials and Device Structures for Electroluminescent Applications,” National Information Display Laboratory, $25K for 1 year, 1992-1993.

22. “Phosphor Technology Center of Excellence,” ARPA, $10,000,000 for 4 years, 1993-1997.

23. “MBE/MOMBE Module and Process for IRFPA/FM: Metalorganic Molecular Beam Epitaxy and Processing Techniques for the Flexible Manufacturing of HgCdTe Focal Plane Arrays,” ARPA, $1,532,991 for 4 years, 9/93-9/97.

24. “New Material Structures for High Definition Displays,” ARO, $181,791 for 3 years, 9/94-8/97.

25. “Next Generation High Resolution and Color TFEL Displays,” ARPA, $1.054M for 2.5 years, 4/95-9/97.

26. “GRA Cost Share for Next Generation Resolution and Color TFEL Displays for $1.05M, 2.5 years, 4/95-9/97.

27. “Field Emission Displays: Phosphor Screen Development,” ARPA, $800K for 2.5 years, 6/95-12/97.

28. “GRA Cost Share for Field Emission Displays,” Georgia Research Alliance, $800,000 for 2.5 years, 6/95-12/97.

29. “Thin Film Phosphors for Image Intensifier Tubes,” ITT, $65,000 for 1 year.

30. “GRA Cost Share for Phosphor Center,” Georgia Research Alliance, $3.0M, 6/96-5/97.

31. “Phosphor Technology Center of Excellence: Phase II, DARPA, $4,500,000 for 3 years, 1997-2002.

32. “Phosphor Synthesis and Characterization,” DARPA, $1.24M for 3 years, 10/97-9/2000.

33. “Characterization and Synthesis of High Performance Phosphors for Plasma Displays,” Samsung Display Devices, $140,000, 6/98-5/00.

34. “New Coating Technologies for Low Voltage (<500V) Field Emission Display Phosphors,” Samsung Display Devices, $60,000, 6/98-5/00.

35. “Manufacturable Blue Electroluminescent Materials,” Planar International, $476,000, 3/2000-9/2001.

36. "Emissive and Active Photonic Crystals" Sandia National Laboratories, $37,000, 1999-2002

37. "MURI - Intelligent Luminescence for Communication, Display and Identification" ARO, $5,000,000, 2001-2006.

38. "High-Performance Plasma and Photonic Phosphors", Sumitomo Chemical, $330,262, 2001- 2002.

39. “X-Ray Phosphors for Synchrotron Beamlines”, Bruker Corporation, $210,000, 2002-present

VII. HONORS AND AWARDS

Standard Telecommunications Laboratories Graduate Research Scholarship	1962-1965
Reading University Research Fellow	1965-1967
Georgia Tech Research Institute Award for Outstanding Performance in Research	1988

Georgia Tech Research Institute Fellow	1990-Present
Industry Week Award	1995
President of Society of Information Display; Citation Award	1996
President of Society of Information Display; Certificate of Commendation	1997-1999
Georgia Tech: Outstanding Achievements in Research Program Development	2004
Georgia Tech Sigma Xi Chapter: Sustained Research Award	2004