Shuji Nakamura, Ph.D.

Professor of Materials Department
University of California, Santa Barbara
Santa Barbara, CA 93106-5050

EDUCATION

1994	University of Tokushima, Japan Doctor of Engineering
1979	University of Tokushima, Japan Master of Electronic Engineering
1977	University of Tokushima, Japan Bachelor of Electronic Engineering

ACADEMIC APPOINTMENTS

1999 – Present	University of California, Santa Barbara Professor, Materials Department
1993 – 1999	Nichia Chemical Ind., Ltd. Senior Researcher, Department of Research and Development (R&D)
1989 – 1993	Nichia Chemical Ind., Ltd. Group Head, Research and Development 2nd Section
1988 – 1989	University of Florida Visiting Research Associate, Electronic Engineering
1985 – 1988	Nichia Chemical Ind., Ltd. Group Head, Research and Development 1st Section
1979 – 1984	Nichia Chemical Ind., Ltd. Research and Development

HONORS & AWARDS

1994, 1996	Nikkei BP Engineering Award
1994, 1997	Best Paper Award of Japanese Applied Physics Society
1995	Sakurai Award
1996	Nishina Memorial Award
1996	IEEE Lasers and Electro-Optics Society Engineering Achievement Award
1996	Society for Information Display (SID) Special Recognition Award
1997	Okochi Memorial Award
1997	Materials Research Society (MRS) Medal Award
1998	Innovation in Real Materials (IRM) Award
1998	C&C Award
1998	IEEE Jack A. Morton Award
1998	British Rank Prize
1999	Julius-Springer Prize for Applied Physics
2000	Takayanagi Award
2000	Carl Zeiss Research Award

HONORS & AWARDS (Continued)

2000	Honda Award
2000	Crystal Growth and Crystal Technology Award
2001	Asahi Award
2001	Cree Professor in Solid State Lighting and Display Endowed Chair
2001	OSA Nick Holonyak Award
2001	LEOS Distinguished Lecturer Award
2002	IEEE/LEOS Quantum Electronics Award
2002	Recipient of the Franklin Institute's 2002 Benjamin Franklin Meda l in Engineering
2002	Takeda Award
2002	The Economist Innovation Award 2002 "No Boundaries"
2002	World Technology Award
2003	CompoundSemi Pioneer Award
2003	National Academy of Engineering Member
2003	Blue Spectrum Pioneer Awards
2004	The Society for Information Display Karl Ferdinand Braun Prize
2006	Global Innovation Leader Award, Optical Media Global Industry Awards
2006	Millennium Technology Prize
2007	Santa Barbara Region Chamber of Commerce Innovator of the Year Award
2007	Czochralski Award
2008	Japanese Science of Applied Physics (JSAP) Outstanding Paper Award for the "Demonstration of Nonpolar m-Plane InGaN/GaN Laser Diode"
2008	The Prince of Asturias Award for Technical Scientific Research (The Prince of Asturias Foundation)
2009	Harvey Prize
2012	Technology and Engineering Emmy Award
2012	Inventor of the Year Award by Silicon Valley Intellectual Property Law Association
2013	LED Pioneer Awards
2013	LUX Awards "LUX person of the Year in association with One-LUX"
2013	Awards of Outstanding Achievement for Global SSL Development by ISA International SSL Alliances
2014	Nobel Prize in Physics

PROFESSIONAL ACTIVITIES

1995	Developed the first group-III nitride-based blue/green LEDs
1995	Developed the first group-III nitride-based violet laser diodes (LDs)
1998 – 2000	Editorial Board, Applied Physics Society
2000 – 2007	Research Director, Solid State Lighting and Display Center
2007 – 2013	Research Director, Solid State Lighting and Energy Center
2014 – Present	Research Director, Solid State Lighting and Energy Electronics Center
2000 – Present	Editorial Board, Compound Semiconductor Magazine
2001 – Present	Editor, Materials Research Society Conference Proceedings
2001 – Present	Director, Exploratory Research for Advanced Technology (ERATO)
2004 – Present	Honorary Professor, Universtät Bremen (Germany)
2004 – Present	Guest Professor, Shinshu University (Japan)
2004 – Present	Guest Professor, Tottori University (Japan)
2004 – Present	Guest Professor, University of Tokushima (Japan)
2005 – Present	Honorary Professor, Wuhan University (China)
2007 – Present	Visiting Honorary Professor, Hong Kong University of Science & Technology
2007 – Present	Guest Professor, University of Ehime (Japan)
2009 – Present	Advisor, Shanghai Research Center of Engineering and Technology for Solid-State Lighting (China)
2009 – Present	Advisory Professor, Fudan University (China)

PUBLICATIONS 491 as of 11/20/12

1. S. Nakamura, S. Sakai, S.S. Chang, R.V. Ramaswamy, J.-H. Kim, G. Radhakrishnan, J.K. Liu, J. Katz, *Transient-mode liquid phase epitaxial growth of GaAs on GaAs-coated Si substrates prepared by migration-enhanced molecular beam epitaxy,* J. Cryst. Growth, **97**, pp. 303-309. (1989)

2. S. Nakamura, H. Takagi, *High-power and high-efficiency P-GaAlAs/N-GaAs: Si single herterostucture infrared emitting diodes,* Jpn. J. Appl. Phys*.,* **29,** No. 12, pp. 2694-2697. (1990)

3. S. Nakamura, Y. Harada, M. Senoh, *Novel metalorganic chemical vapor deposition system for GaN growth,* Appl. Phys. Lett., **Vol. 58** No. 18, pp. 2021-2023 (1991)

4. S. Nakamura, *Analysis of real-time monitoring using interference effects,* Jpn. J. Appl. Phys., **Vol. 30** No. 7, pp.1348-1353 (1991)

5. S. Nakamura, *In situ monitoring of GaN growth using interference effects,* Jpn. J. Appl. Phys., **Vol. 30** No. 8, pp. 1620-1628 (1991)

6. S. Nakamura, *GaN growth using GaN buffer layer,* Jpn. J. Appl. Phys., **Vol. 30** No. 10A, pp. L1705-L1707 (1991)

7. S. Nakamura, M. Senoh, T. Mukai, *Highly P-typed Mg-doped GaN films grown with GaN buffer layers,* Jpn. J. Appl. Phys., **Vol. 30** No. 10A, pp.L1708-L1711 (1991)

8. S. Nakamura, T. Mukai, M. Senoh, *High-power GaN P-N junction blue-light-emitting diodes,* Jpn. J. Appl. Phys., **Vol. 30** No. 12A, pp. L1998-L2001 (1991)

9. S. Nakamura, T. Mukai, M. Senoh, N. Iwasa, *Thermal annealing effects on P-type Mg-doped GaN films*, Jpn. J. Appl. Phys., **Vol. 31** No. 2B, pp. L139-L142 (1992)

10. S. Nakamura, N. Iwasa, M. Senoh, T. Mukai, *Hole compensation mechanism of P-type GaN films,.* Jpn. J. Appl. Phys., **Vol. 31** No. 5A, pp. 1258-1266 (1992)

11. S. Nakamura, T. Mukai, M. Senoh, *In situ monitoring and hall measurements of GaN growth with GaN buffer layers,* J. Appl. Phys., **Vol. 71**, No. 11, pp. 5543-5549. (1992)

12. S. Nakamura, T. Mukai, M. Senoh, *Si- and Ge-doped GaN films grown with GaN buffer layers,.* Jpn. J. Appl. Phys., **Vol. 31** No. 9A, pp. 2883-2888. (1992)

13. S. Nakamura, T. Mukai, *High-quality InGaN films grown on GaN films,* Jpn.J.Appl. Phys.,**Vol. 31** No.10B, pp. L1457-L1459. (1992).

14. S. Nakamura, M. Senoh, T. Mukai, *p-GaN/N-InGaN/N-GaN double-heterostructure blue-light-emitting diodes*, Jpn. J. Appl. Phys., **Vol. 32** No. 1A/B. pp. L8-L11 (1993)

15. S. Nakamura, T. Mukai, M. Senoh, *Si-doped InGaN films grown on GaN films,* Jpn. J. Appl. Phys., **Vol. 32** No. 1A/B, pp. L16-L19 (1993)

16. S. Nakamura, N. Iwasa, S. Nagahama, *Cd-doped InGaN films grown on GaN films,* Jpn. J. Appl. Phys., **Vol. 32** No. 3A, pp. L338-L341 (1993)

17. S. Nakamura, M. Senoh, T. Mukai, *High-power InGaN/GaN double-heterostructure violet light-emitting diodes,* Appl. Phys. Lett., **Vol. 62** No. 19, pp. 2390-2392 (1993)

18. S. Nakamura, *InGaN blue-light-emitting diodes,* Journal of the Institute of Electronics, Information and Communication Engineers, Vol. 76 No. 9, pp. 3911-3915 (1993)

19. S. Nakamura, T. Mukai, M. Senoh, S. Nagahama, N. Iwasa, *In/sub x-Ga/sub (1-x)-N/In/sub y-Ga/sub (1-y)-N superlattices grown on GaN films.* J. Appl. Phys., **Vol. 74** No. 6, pp. 3911-3915 (1993)

20. S. Nakamura, *Blue LEDs, realization of LCD by double-heterostructure.* No. 602, pp. 93-102 (1994)

21. S. Nakamura, T. Mukai, M. Senoh, *Candela-class high-brightness InGaN/AlGaN double-heterostructure blue-light-emitting diodes,* Appl. Phys. Lett., **Vol. 64** No. 13, pp. 1687-1689 (1994)

22. S. Nakamura, *Nichia's 1cd blue LED paves way for full-color display.* Nikkei Electronics Asia, June (1994).

23. S. Nakamura, *InGaN/AlGaN double-heterostructure light-emitting diodes,* Extended Abstracts of the 1994 International Conference on Solid State Devices and Materials, JSAP, pp. 81-83. (1994)

24. S. Nakamura, *Realized high bright blue laser-emitting diodes,* Scientific American, October (1994)

25. S. Nakamura, *Growth of In/sub x-Ga/sub (1-x)-N compound semiconductors and high-power InGaN/AlGaN double heterostructure violet-light-emitting-diodes,* Microelectronics Journal, **Vol. 25**, pp. 651-659 (1994)

26. S. Nakamura, *Zn-doped InGaN growth and InGaN/AlGaN double-heterostructure blue-light-emitting diodes,* J. Cryst. Growth, Vol. 145, pp. 911-917 (1994)

27. S. Nakamura, *InGaN/AlGaN double-heterostructure blue LEDs,* Mat. Res. Symp. Proc., **Vol. 339**, pp. 173-178 (1994)

28. S. Nakamura, T. Mukai, M. Senoh, *High-brightness InGaN/AlGaN double heterostructure blue-green-light-emitting diodes,* J. Appl. Phys., **Vol. 76**, pp. 8189-8191 (1994)

29. S. Chichibu, T. Azhata, T. Sota, S. Nakamura, *Excitonic emissions from hexagonal GaN epitaxial layers,* J. Appl. Phys., **Vol. 79** No. 5, pp. 2784-2786 (1995)

30. S. Nakamura, *Highly luminous III-V nitride-based devices head for the highway, color displays,* IEEE, May (1995)

31. S. Nakamura, *InGaN/AlGaN blue-light-emitting diodes,* J. Vac. Sci. & Tech. A, **Vol. 13** No. 3, pp. 705-710 (1995)

32. S. Nakamura, *High-brightness InGaN blue, green, and yellow light-emitting diodes with quantum well structures,* Jpn. J. Appl. Phys., **Vol. 34** No. 7A, pp. L797-L799 (1995)

33. S. Nakamura, *LED full color display,* IEICE, **Vol. 78**, No. 7, pp. 683-688 (1995)

34. S. Nakamura, *InGaN light-emitting diodes with quantum well structures,*Extended Abstracts of the 1995 International Conference on Solid State Devices and Materials 08/21-24/95, Osaka, Japan (JSAP) (1995)

35. S. Nakamura, M. Senoh, N. Iwasa, S. Nagahama, Y. Yamada, T. Mukai, *Superbright green InGaN single-quantum-well structure light-emitting diodes,* Jpn. J. Appl. Phys., **Vol. 34** No. 10B, pp. L1332-L1335 (1995)

36. S. Nakamura, M. Senoh, N. Iwasa, S. Nagahama, *High-power InGaN single-quantum-well-structure blue and violet light-emitting diodes,* Appl. Phys. Lett., **Vol. 67** No. 13, pp. 1868-1870 (1995)

37. S. Nakamura, *Laser diodes and progress of InGaN-based IV-V system LED,* Optik, **Vol. 24**, No. 11, pp. 673-678 (1995)

38. T. Azuhata, T. Soto, K. Suzuki, S. Nakamura, *Polarized Raman Spectra in GaN,* J. Phys. Condens. Matter, **Vol. 7** No. 10, pp. L129-L133 (1995)

39. S. Nakamura, *III-V Nitride light-emitting diodes,* OSA Proceedings on Advanced Solid-State Lasers, **Vol. 24**, pp. 20-24 (1995)

40. W.E. Carlos, E.R. Glaser, T.A. Kennedy, S. Nakamura, *Paramagnetic resonance in GaN-based light emitting diodes,* Appl. Phys. Lett., Vol. 67 No. 16, pp. 2376-2378 (1995)

41. S. Nakamura, *Recent developments of GaN based LEDs,* Proceedings of Topical Workshop on III-V Nitrides, pp. 11-14 (1995)

42. S. Chichibu, T. Azuhata, T. Sota, S. Nakamura, *Contribution of excitons in the photoluminescence spectra of h-GaN epitaxial layers grown on sapphire substrates by TF-MOCVD,* International Symposium on Blue Laser and Light Emitting Diodes, March 5-7, pp. 202-205 (1996)

43. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto. *InGaN-based multi-quantum-well-structure laser diodes.* Jpn. J. Appl. Phys., **Vol. 35** No. 1B, pp. L74-L76 (1996)

44. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, *InGaN multi-quantum-well-structure laser diodes with cleaved mirror cavity facets,* Jpn. J. Appl. Phys., **Vol. 35** No. 2B, pp. L217-L220 (1996)

45. S. Nakamura, *Pulsed operation of violet laser diodes,* Electr. Mater.,March issue, pp. 159-164 (1996)

46. S. Nakamura, N. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, *InGaN multi-quantum-well structure laser diodes grown on MgAl(sub 2)O(sub 4) substrates,* Appl. Phys. Lett., **Vol. 68** No. 15, pp. 2105-2107 (1996)

47. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, *Characteristics of InGaN multi-quantum-well-structure laser diodes,* Appl. Phys. Lett., **Vol. 68** No. 23, pp. 3269-3271 (1996)

48. S. Chichibu, A. Shikanai, T. Azuhata, T. Sota, A. Kuramata, K. Horino, S. Nakamura, *Effects of biaxial strain on exciton resonance energies of hexagonal GaN heteroepitaxial layers,* Appl. Phys. Lett., **Vo. 68** No. 26, pp. 3766-3768 (1996)

49. S. Nakamura, *InGaN-based blue/green LEDs and laser diodes,* Adv. Mater., **Vol. 8** No. 8, pp. 689-692 (1996)

50. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, Y. Sugimoto, H. Kiyoku, *Continuous-wave operation of InGaN multi-quantum-well-structure laser diodes at 233K,* Appl. Phys. Lett., **Vol. 69** No. 20, pp. 3034-3036 (1996)

51. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushito, Y. Sugimoto, H. Kiyoku, *Room-temperature continuous-wave operation of InGaN multi-quantum-well-structure laser diodes,* Appl. Phys. Lett., **Vol. 69** No. 26, pp. 4056-4058 (1996)

52. S. Chichibu, T. Azuhata, T. Sota, S. Nakamura, *Spontaneous emission of localized excitons in InGaN single and multiquantum well structures,* Appl. Phys. Lett., **Vol. 69** No. 27, pp. 4188-4190 (1996)

53. S. Nakamura, *Present status and future prospects of GaN-based light emitting devices,* Jpn. Soc. Appl. Phys., **Vol. 65** No. 7, pp. 676-685 (1996)

54. T. Azuhata, T. Matsunaga, K. Shimada, K. Yoshida, T. Sota, K. Suzuki, S. Nakamura, *Optical phonons in GaN,* Physica B, **Vol. 219-220**, pp. 493-495 (1996)

55. S. Nakamura, *Fabrication of blue and green nitride light-emitting diodes,* Inst. Phys. Conf. Ser. No. 142, Chapter 6 (1996)

56. S. Nakamura, *III-V nitride-based light-emitting diodes,* Diamond and Related Materials, **Vol. 5** Issue 1-3, pp. 496-500 (1996)

57. Y. Kawakami, Z.G. Peng, Y. Narukawa, Sz. Fujita, Sg. Fujita, S. Nakamura, *Recombination dynamics of excitons and biexcitons in hexagonal GaN epitaxial layer,* Appl. Phys. Lett., **Vol. 69** No. 10, pp. 1414-1416 (1996)

58. K. Okada, Y. Yamada, T. Taguchi, F. Sasaki, S. Kobayashi, T. Tani, S. Nakamura, G. Shinomiya, *Biexciton luminescence from GaN epitaxial layers*, Jpn. J. Appl. Phys., **Vol. 35** No. 6B, pp. L787-L789 (1996)

59. W. E. Carlos, E. R. Glaser, T. A. Kennedy, S. Nakamura, *Magnetic resonance studies of recombination processes in GaN light-emitting diodes,* Mat. Res. Soc. Symp. Proc. **395**, pp. 673-678 (1996)

60. S. Nakamura, *InGaN light-emitting diodes with quantum-well structures,* Mat. Res. Soc. Symp. Proc. **395**, pp. 879-887 (1996)

61. S. Nakamura, *High-brightness blue-green LEDs and first III-V nitride-based laser diodes*, Proceedings of SPIE**, Vol. 2693**, pp. 43-56 (1996)

62. T. Taguchi, T. Maeda, Y. Yamada, S. Nakamura, G. Shinomiya, *Band edge emission of InGaN active epilayers in the high-brightness Nichia blue LEDs,* International Symposium on Blue Laser and Light Emitting Diodes, March 5-7, pp. 372-374 (1996)

63. S. Nakamura, *First successful III-V nitride based laser diodes,* International Symposium on Blue Laser and Light Emitting Diodes, March 5-7, pp. 119-124 (1996)

64. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, Y. Sugimoto, H. Kiyoku, *Optical gain and carrier lifetime of InGaN multi-quantum well structure laser diodes,* Appl. Phys. Lett., **Vol. 69** No. 11, pp. 1568-1570 (1996)

65. S. Nakamura, *III-V nitride based blue/green LEDs and LDs,* 23rd ICPS Proc., Berlin, July 21-26, **Vol. 1**, pp. 11-18 (1996)

66. T. Taguchi, Y. Yamada, K. Okada, T. Maeda, F. Sasaki, S. Kobayashi, T. Tani, S. Nakamura, G. Shinomiya, *Time-resolved luminescence spectroscopy of GaN and InGaN epitaxial layers under high density excitation,* 23rd ICPS Proc., Berlin, July 21-26, **Vol. 1**, pp. 541-544 (1996)

67. W. E. Carlos, E. R. Glaser, T. A. Kennedy, S. Nakamura, *Magnetic resonance studies of recombination processes in GaN-based single-quantum-well light-emitting diodes,* 23rd ICPS Proc., Berlin, July 21-26, **Vol. 4**, pp. 2921-2924 (1996)

68. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, Y. Sugimoto, H. Kiyoku, *Ridge-geometry InGaN multi-quantum-well-structure laser diodes,* Appl. Phys. Lett., Vol. 69 No. 10, pp. 1477-1479 (1996)

69. S. Chichibu, T. Azuhata, T. Sota, S. Nakamura, *Excitonic emissions from hexagonal GaN epitaxial layers,* J. Appl. Phys., **Vol. 79** No. 5, pp. 2784-2786 (1996)

70. K. G. Zolina, V. E. Kudryashov, A. N. Turkin, A. E. Yunovich, S. Nakamura, *Luminescence spectra of superbright blue and green InGaN/AlGaN/GaN light-emitting diodes,* MRS Internet Journal of Nitride Semiconductor Research, **Vol. 1** (1996)

71. A. Shikanai, T. Azuhata, T. Sota, S. Chichibu, A.Kuramata, K. Horino, S. Nakamura, *Biaxial strain dependence of exciton resonance energies in wurzite GaN,* J. Appl. Phys., **Vol. 81** No. 1, pp. 417-424 (1997)

72. Y. Narukawa, Y. Kawakami, S. Fujita, S. Fujita, S. Nakamura, *Recombination dynamics of localized excitons in In(sub 0.20)Ga(sub 0.80)N-In(sub 0.05)Ga(sub0.95)N multiple quantum wells,* Phys. Rev. B, **Vol. 55** No. 4, pp. R1938-R1941 (1997)

73. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, Y. Sugimoto, H. Kiyoku, *Longitudinal mode spectra and ultrashort pulse generation of InGaN multiquantum well structure,* Appl. Phys. Lett., **Vol. 70** No. 5, pp. 616-618 (1997)

74. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, Y. Sugimoto, H. Kiyoku, *Room-temperature continuous-wave operation of InGaN multi-quantum-well-structure laser diodes with a long lifetime,* Appl. Phys. Lett., **Vol. 70** No. 7, pp. 868-870 (1997)

75. S. Nakamura, *Blue-green light-emitting diodes and violet laser diodes,* MRS Bulletin, **Vol. 22** No. 2, pp. 29-35 (1997)

76. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, Y. Sugimoto, H. Kiyoku, *Room-temperature continuous-wave operation of InGaN multi-quantum-well structure laser diode with a lifetime of 27 hours,* Appl. Phys. Lett., **Vol. 70** No. 11, pp.1417-1419 (1997)

77. S. Chichibu, H. Okumura, S. Nakamura, G. Feuillet, T. Azuhata, T. Sota, S. Yoshida, *Exciton spectra of cubic and hexagonal GaN epitaxial films,* Jpn. J. Appl. Phys., **Vol 36** No. 3B, pp. 1976-1983 (1997)

78. S. Nakamura, *GaN-based blue/green semiconductor laser,* IEEE Journal of Selected Topics in Quantum Electronics, **Vol. 36** No. 3B, pp. 435-442 (1997)

79. S. Chichibu, T. Azuhata, T. Sota, S. Nakamura, *Optical properties of InGaN,* Bulletin of Solid State Physics and Applications (1997)

80. Y. Kawakami, S. Saijyo, Y. Narukawa, Sz. Fujita, Sg. Fujita, S. Nakamura, *Time-resolved electroluminescence spectroscopy of InGaN-single quantum well-based light emitting diodes,* Bulletin of Solid State Physics and Applications (1997)

81. S. Nakamura, *Characteristics of RT-CW operated bluish-purple laser diodes,* Bulletin of Solid State Physics and Applications (1997)

82. Y. Narukawa, Y. Kawakami, M. Funato, Sz. Fujita, Sg. Fujita, S. Nakamura, *Role of self-formed InGaN quantum dots for exciton localization in the purple laser diode emitting at 420nm,* Appl. Phys. Lett., **Vol. 70** No. 8, pp. 981-983 (1997)

83. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushito, Y. Sugimoto, H. Kiyoku, *Subband emission of InGaN multi-quantum-well laser diodes under room-temperature continuous wave operation,* Appl. Phys. Lett., Vol. 70 No. 20, pp. 2753-2755 (1997)

84. S. Chichibu, T. Azuhata, T. Sota, S. Nakamura, *Luminescence from localized states in InGaN epilayers,* Appl. Phys. Lett., **Vol. 70** No. 21, pp. 2822-2824 (1997)

85. S. Chichibu, T. Mizutani, T. Shioda, H. Nakanishi, T. Deguchi, T. Azuhata, T. Sota, S. Nakamura, *Urbach-Matienssen tails in a wurzite GaN epilayer*, Appl. Phys. Lett., Vol. 70 No. 25, pp. 3440-3442 (1997)

86. S. Nakamura, *InGaN-based blue laser diodes,* IEEE Journal of Selected Topics in Quantum Electronics, **Vol. 3** No. 3, pp. 712-718 (1997)

87. S. Nakamura, *Success story with blue LEDs,* Science Journal Kagaku, **Vol. 67** No. 6, pp.438-450 (1997)

88. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, Y. Sugimoto, H. Kiyoku, *High-power, long-lifetime InGaN multi-quantum-well-structure laser diodes,* Jpn. J. Appl. Phys., **Vol. 36** No. 8B, pp. L1059-L1061 (1997)

89. S. Chichibu, K. Wada, S. Nakamura. *Spatially resolved cathodoluminescence spectra of InGaN quantum wells*. Appl. Phys. Lett., **Vol. 71** No. 16, pp. 2346-2348 (1997)

90. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, T. Kozaki, H. Umemoto, M. Sano, K. Chocho, *InGaN/GaN/AlGaN-based laser diodes with modulation-doped strained-layer superlattices,* Jpn. J. Appl. Phys., **Vol. 36** No. 12A, pp. L1568-L1571 (1997)

91. S. Nakamura, *InGaN quantum-well structure blue LEDs and LDs,* Journal of Luminescence, **Vol. 72-74**, pp. 55-58 (1997)

92. S. Nakamura, *Present and future aspects of blue light emitting devices,* Applied Surface Science, **Vol. 113-114**, pp. 689-697 (1997)

93. S. Nakamura, *First III-V-nitride-based violet laser diodes,* J. Cryst. Growth, **Vol. 170** Issue 1-4, pp. 11-15 (1997)

94. S. Nakamura, *First laser-diodes fabricated from III-V nitride based materials,* Mater. Sci.& Engin. B, **Vol. 43** Issue 1-3, pp. 258-264 (1997)

95. S. Nakamura, *III-V nitride based light-emitting devices,* Solid State Communications, **Vol. 102** No. 2-3, pp. 237-248 (1997)

96. S. Nakamura, *RT-CW operation of InGaN multi-quantum-well structure laser diodes,* Semiconductors & Semimetals, **Vol. 48**, pp. 391-443 (1997)

97. S. Nakamura, *Group III-V nitride-based ultraviolet blue-green-yellow light-emitting diodes and laser diodes,* Semiconductors & Semimetals, **Vol. 48**, pp. 391-443 (1997)

98. G. Mohs, T. Aoki, M. Nagai, R. Shimano, M. Kuwata-Gonokami, S. Nakamura, *Failure of the modal gain model in a GaN based laser diode,* Solid State Communications, **Vol. 104** No. 11, pp. 643-648 (1997)

99. S. Nakamura, *Lessons from research of blue LEDs,* J. Phys. Soc. Jpn., **Vol. 52** No. 12, pp.924-925 (1997)

100. S. Nakamura, *Room-temperature CW operation of GaN based laser diodes,* The Review of Laser Engineering, **Vol. 25** No. 7, pp. 498-503 (1997)

101. S. Nakamura, *How I was led to the discovery of the InGaN-based blue/green LEDs,* Semiconductor News, July-December 1997, pp. 87-92 (1997)

102. F. A. Ponce, D. Cherns, W. T. Young, J. W. Steeds, S. Nakamura, *Observation of nanopipes and inversion domains in high quality GaN epitaxial layers,* Mat. Res. Soc. Proc., **449**, pp. 405-410 (1997)

103. S. Chichibu, T. Azuhata, T. Sota, S. Nakamura, *Recombination of localized excitons in InGaN single and multi-quantum well structures,* Mat. Res. Soc. Proc., **449**, pp. 653-658 (1997)

104. Y. Narukawa, Y. Kawakami, Sz. Fujita, Sg. Fujita, S. Nakamura, *Emission mechanism of the InGaN MQW grown by MOCVD,* Mat. Res. Soc. Proc., **449**, pp. 665-670 (1997)

105. W. E. Carlos, E. R. Glaser, T. A. Kennedy, S. Nakamura, *Magnetic resonance studies of GaN-based single quantum well LEDs,* Mat. Res. Soc. Symp. Proc., **449**, pp. 757-767 (1997)

106. S. Nakamura, *Characteristics of InGaN multi-quantum-well structure laser diodes,* Mat. Res. Soc. Symp. Proc., **449**, pp. 1135-1142 (1997)

107. S. Nakamura, *Characteristics of RT-CW operated InGaN multi-quantum-well-structure laser diodes,* MRS Internet J. Nitride Semicond. Res. 2, **5** (1997)

108. M. Yamaguchi, T. Yagi, T. Azuhata, T. Sota, K. Suzuki, S. Chichibu, S. Nakamura, *Brillouin scattering study of gallium nitride: elastic stiffness constants,* Journal of Physics: Condensed Matter, **Vol. 9** No. 1, pp. 241-248 (1997)

109. S. Nakamura, *Present performance of InGaN based blue/green/yellow LEDs,* Proceedings of SPIE,**Vol**. **3002**, pp. 26-35 (1997)

110. T. Deguchi, A. Shikanai, T. Sota, S. Chichibu, N. Sarukura, H. Ohtaka, T. Yamanaka, S. Nakamura, *Nanosecond pump-and-probe study of wurtzite GaN,* Materials Science and Engineering, **B50**, pp. 180-182 (1997)

111. T. Deguchi, T. Azuhata, T. Sota, S. Chichibu, S. Nakamura, *Gain spectra in cw InGaN/GaN MQW laser diodes,* Materials Science and Engineering, **B50**, pp. 251-255 (1997)

112. Y. Kawakami, Y. Narukawa, K. Sawada, S. Saijo, Sz. Fujita, Sg. Fujita, S. Nakamura, *Recombination dynamics of localized excitons in self-formed InGaN quantum dots,*Materials Science and Engineering B, **Vol. 50** Issue 1-3, pp. 256-263 (1997)

113. V. E. Kudryashov, A. N. Turkin, A. E. Yunovich, K. G. Zolina, S. Nakamura, *Spectra of superbright blue and green InGaN/AlGaN/GaN light-emitting diodes,* J. Eur.Ceram. Soc., **Vol. 17** No. 15/16, pp. 2033-2037, (1997)

114. D. Cherns, W. T. Young, M. A. Saunders, F. A. Ponce, S. Nakamura, *The analysis of nanopipes and inversion domains in GaN thin films,* Inst. Phys. Conf. Ser., **No. 157**, pp. 187-190 (1997)

115. S. Nakamura, *Present status and future of blue LEDs and LDs,* Rev. Laser Engin., **Vol. 25** No. 12, pp. 850-854 (1997)

116. D. Cherns, W. T. Young, J. W. Steeds, F. A. Ponce, S. Nakamura, *Observation of coreless dislocations in alpha-GaN,* Journal Crystal Growth, **Vol. 178** No. 1-2, pp. 201-206 (1997)

117. S. Nakamura, G. Fasol, *The Blue Laser Diode (The Complete Story),* Springer-Verlag: Heidelberg (1997)

118. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamado, T. Matsushita, H. Kiyoku, V. Sugimoto, T. Kozaki, H. Umemoto, M. Sano, K. Chocho, *InGaN/GaN/AlGaN-based laser diodes with modulation-doped strained-layer superlattices grown on an epitaxially laterally overgrown GaN substrate,* Appl. Phys. Lett., **Vol. 72** No. 2, pp. 211-213 (1998)

119. S. Nakamura, *Applications of LEDs and LDs,* Semiconductors & Semimetals, **Vol. 50**, pp. 431-457 (1998)

120. S. Nakamura, *Progress with GaN-based blue/green LEDs and bluish-purple semiconductor LDs,* Electronics and Communications in Japan, **Vol. 81** No. 5, pp. 1-8 (1998)

121. A. Alemu, B. Gil, M. Julier, S. Nakamura, *Optical properties of wurzite GaN epilayers growns on A-plane sapphire,* Phys. Rev. B, **Vol. 57** No.7, pp. 3761-3764 (1998)

122. S. Nakamura, *Light emission moves into blue,* Physics World, February (1998)

123. M. Julier, J. Campo, B. Gil, J.P. Lascaray, S. Nakamura, *Determination of the spin-exchange interaction constant in wurzite GaN,* Phys. Rev. B, **Vol. 57** No. 12, pp. R6791-R6794 (1998)

124. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, T. Kozaki, H. Umemoto, M. Sano, K. Chocho, *High-power, long-lifetime InGaN/GaN/AlGaN-based laser diodes grown on pure GaN substrates,* Jpn. J. Appl. Phys., **Vol. 37** No. 3B, pp. L309-L312 (1998)

125. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, T. Kazaki, H. Umemoto, M. Sano, K. Chocho, *Continuous-wave operation of InGaN/GaN/AlGaN-based laser diodes grown on GaN substrates,* Appl. Phys. Lett., **Vol. 72** No. 16, pp. 2014-2016 (1998)

126. S. Nakamura, *InGaN multiquantum-well-structure laser diodes with GaN-AlGaN modulation-doped strained layer superlattice,* IEEE Journal of Selected Topics in Quantum Electronics, **Vol. 4** No. 3, pp. 483-489 (1998)

127. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, T. Kozaki, H. Umemoto, M. Sano, K. Chocho, *Violet InGaN/GaN/AlGaN-based laser diodes with an output power of 420mW,* Jpn. J. Appl. Phys., **Vol. 37** No. 6A, pp. L627-L629 (1998)

128. T. Mukai, K. Takekawa, S. Nakamura, *InGaN-based blue light-emitting diodes grown on epitaxially laterally overgrown GaN substrates,* Jpn. J. Appl. Phys., **Vol. 37** No. 7B, pp. L839-L841 (1998)

129. S. Chichibu, T. Sota, K. Wada, S. Nakamura, *Exciton localization in InGaN quantum well devices,* J. Vac. Sci. Technol. B, **Vol. 16** No. 4, pp. 2204-2214 (1998)

130. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, T. Kozaki, H. Umemoto, M. Sano, K. Chocho, *InGaN/GaN/AlGaN-based laser diodes with cleaved facets grown on GaN substrates,* Appl. Phys. Lett., **Vol. 73** No. 6, pp. 832-834 (1998)

131. S. Nakamura, *The roles of structural imperfections in InGaN-based blue light-emitting diodes and laser diodes,* Science, **Vol. 281** No. 5379, pp. 956-961 (1998)

132. T. Mukai, M. Yamada, S. Nakamura, *Current and temperature dependences of electroluminescence of InGaN-based UV/blue/green light-emitting diodes,* Jpn. J. Appl. Phys., **Vol. 37**, pp. L1358-L1361 (1998)

133. S. Nakamura, *Materials issues for InGaN-based lasers,* J. Elect. Mater., **Vol. 27** No. 4**,** pp. 160-165 (1998)

134. S. Nakamura, *Cathodoluminescence study on quantum microstructures,* Jpn. Soc. Appl. Phys., **Vol. 67** No. 7, pp. 798-801 (1998)

135. T. Mukai, D. Morita, S. Nakamura, *High-power UV InGaN/AlGaN double-heterostructure LEDs,* J. Cryst. Growth, **Vol. 189/190,** pp. 778-781 (1998)

136. G. Mohs, T. Aoki, R. Shimano, M. Kuwata-Gonokami, S. Nakamura, *On the grain mechanism in GaN based laser diodes,* Solid State Communications, **Vol. 108** No. 2, pp. 105-110 (1998)

137. S. Nakamura, *InGaN-based laser diodes,* Annu. Rev. Mater. Sci., **Vol. 28**, pp. 125-152 (1998)

138. A. Alemu, M. Julier, J. Campo, B. Gil, D. Scalbert, J.-P. Lascaray, *Optical anisotropy in GaN grown onto A-plane sapphire,* E-MRS '98 Spring Meeting, Strasbourg, France (1998)

139. T. Deguchi, A. Shikanai, K. Torii, T. Sota, S. Chichibu, S. Nakamura, *Luminescence spectra from InGaN multiquantum wells heavily doped with Si,* Appl. Phys. Lett., **Vol. 72** No. 25, pp. 3329-3331 (1998)

140. K. Ando, T. Yamaguchi, K. Koizumi, Y. Okuno, T. Abe, H. Kasada, A. Ishibashi, K. Nakano, S. Nakamura, *Deep defect center characteristics of wide-bandgap II-IV and III-V blue laser materials,* Proceedings of SPIE (1998, Jan. 26-29), San Jose, California (1998)

141. S. Nakamura, *InGaN/GaN/AlGaN-based laser diodes with an estimated lifetime of longer than 10,000 hours,* MRS Bulletin, **Vol. 23** No. 5, pp. 37-43 (1998)

142. S. Nakamura, K. Kitamura, H. Umeya, H. Jia, M. Kobayashi, A. Yoshikawa, M. Shimotomai, Y. Kato, K. Takahashi, *Bright electroluminescence from CdS quantum dot LED structures,* Electronics Letters, **Vol. 34** No. 25, pp. 2435-2436 (1998)

143. E.R. Glaser, T.A. Kennedy, W.E. Carlos, P.P. Ruden, S. Nakamura, *Recombination processes in In/sub x/Ga/sub 1-x/N light-emitting diodes studied through optically detected magnetic resonance,* Appl. Phys. Lett., **Vol. 73** No. 21, pp. 3123-3125 (1998)

144. S. Nakamura, Y. Ueno, K. Tajima, *Ultrafast (200-fs switching, 1.5-Tb/s demultiplexing) and high-repetition (10 GHz) operations of a polarization-discriminating symmetric Mach-Zehnder all-optical switch,* IEEE Photonics Technology Letters, **Vol. 10** No. 11, pp. 1572-1574 (1998)

145. Y. Kamiura, Y. Yamashita, S. Nakamura, *Photo-enhanced activation of hydrogen-passivated magnesium in p-type GaN films,* Jpn. J. Appl. Phys., **Vol. 37** No. 8B, pp. L970-L971 (1998)

146. Y. Kawakami, Y. Narukawa, K. Sawada, S. Nakamura, *The mechanism of radiative recombination in light-emitting devices composed on InGaN quantum wells,* Electronics and Communications in Japan, **Vol. 81** No. 7, pp. 45-56 (1998)

147. K. Wada, S. Chichibu, S. Nakamura, T. Sota, A. Kozen, T. Murashita, *Cathodoluminescence study of quantum microstructures,* Oyo Buturi, **Vol. 67** No. 7, pp. 789-801 (1998)

148. S. Nakamura, *Commercial blue LDs a step closer for Nichia,* III-Vs Review, **Vol. 11** No.2, pp. 28-32 (1998)

149. T. Deguchi, T. Azuhata, T. Sota, S. Chichibu, M. Arita, H. Nakanishi, S. Nakamura, *Gain spectroscopy of continuous wave InGaN multi-quantum well laser diodes,* Semicond. Sci. and Technol., **Vol. 13** No. 1, pp. 97-101 (1998)

150. Y. Kawakami, Y. Narukawa, K. Sawada, S. Saijyo, S. Fujita, S. Fujita, S. Nakamura, *The mechanism of radiative recombination in light emitting devices composed of InGaN quantum wells,* Transactions of the Institute of Electronics, Information and Communication Engineers C-II, **Vol. J81C-II** No. 1, pp. 78-88 (1998)

151. T. Mukai, H. Narimatsu, S. Nakamura, *Amber InGaN-based light-emitting diodes operable at high ambient temperatures,* Jpn. J. Appl. Phys., **Vol. 37** No. 5A, pp. L479-L481 (1998)

152. Z. L. Weber, S. Ruvimov, W. Swider, Y. Kim, J. Washburn, S. Nakamura, R. S. Kern, Y. Chen, J. W. Yang, *Role of dopants and impurities on pinhole formation; defects formed at InGaN/GaN and AlGaN/GaN quantum wells,* Mat. Res. Soc. Symp. Proc., **Vol. 482**, pp. 375-380 (1998)

153. S. Chichibu, T. Deguchi, T. Sota, K. Wada, S. Nakamura, *Localized excitons in InGaN,* Mat. Res. Soc. Symp. Proc., **Vol. 482**, pp. 613-624 (1998)

154. S. Nakamura, *InGaN/GaN/AlGaN-based laser diodes with an estimated lifetime of longer than 10,000 hours,* Mat. Res. Soc. Symp. Proc., **Vol. 482**, pp. 1145-1156 (1998)

155. Y. Narukawa, S. Saijyo, Y. Kawakami, Sz. Fujita, Sg. Fujita, S. Nakamura, *Time-resolved electroluminescence spectroscopy of InGaN single quantum well LEDs,* J. Crystal Growth, **Vol. 189/190**, pp. 593-596 (1998)

156. Y. Narukawa, K. Sawada, Y. Kawakami, Sz. Fujita, Sg. Fujita, S. Nakamura, *Emission mechanism of localized excitons in InGaN single quantum wells,* J. Crystal Growth, **Vol. 189/190**, pp. 606-610 (1998)

157. W. E. Carlos, S. Nakamura, *Magnetic resonance studies of GaN-based LEDs,* J. Crystal Growth,**Vol. 189/190**, pp. 794-797 (1998)

158. Y. Zohta, H. Kuroda, R. Nii, S. Nakamura, *Frequency dependence of the reverse-biased capacitance of blue and green light-emitting diodes,* J. Crystal Growth, **Vol. 189/190**, pp. 816-819 (1998)

159. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, T. Kozaki, H. Umemoto, M. Sano, K. Chocho, *Present status of InGaN/GaN/AlGaN-based laser diodes,* J. Crystal Growth, **Vol. 189/190**, pp. 820-825 (1998)

160. S. Nakamura, *High-power InGaN-based blue laser diodes with a long lifetime,* J. Crystal Growth, **Vol. 195**, pp. 242-247 (1998)

161. S. Chichibu, H. Marchand, M. S. Minsky, S. Keller, P. T. Fini, J. P. Ibbetson, S. B. Fleischer, J. S. Speck, J. E. Bowers, E. Hu, U. K. Mishra, S. P. DenBaars, T. Deguchi, T. Sota, S. Nakamura, *Emission mechanisms of bulk GaN and InGaN quantum wells prepared by lateral epitaxial overgrowth,* Appl. Phys. Lett., **Vol. 74** No. 10, pp. 1460-1462 (1998)

162. S. Nakamura, *Recent developments in InGaN-based LEDs and LDs,* Acta Physica Polonica A, **Vol. 95**, pp. 153-164 (1998)

163. S. Nakamura, M. Senoh, S.-I. Nagahama, N. Iwasa, T. Yamada, T. Matsushita, H. Kiyoku, Y. Sugimoto, T. Kozaki, I. Umemoto, M. Sano, K. Chocho, *InGaN/GaN/AlGaN-based laser diodes grown on GaN substrates with a fundamental transverse mode,* Jpn. J. Appl. Phys., **Vol. 37 Part 2** No. 9A-B, L1020-L1022 (1998)

164. S. Nakamura, *Progress of GaN-based blue/green LEDs and bluish-purple semiconductor LDs,* Trans. Inst. Electron. Inf. Comm. Engin., **Vol. J81C-II** No. 1, pp. 89-96 (1998)

165. D. Cherns, W. T. Young, M. Sanders, J. W. Steeds, F. A. Ponce, S. Nakamura, *Determination of the atomic structure of inversion domain boundaries in alpha-GaN by transmission electron microscopy,* Philosophical

Magazine A (Physics of Condensed Matter: Structure, Defects, and Mechanical Properties), **Vol. 77** No. 1, pp. 273-286 (1998)

166. T. Mukai, M. Yamada, S. Nakamura, *InGaN-based UV/blue/green/amber/red LEDs,* Light Emitting Diodes: Research, Manufacturing, and Applications III (SPIE), **Vol. 3621** (1998)

167. T. Azuhata, K. Shimada, T. Deguchi, T. Sota, K. Suzuki, S. Chichibu, S. Nakamura, *Infrared lattice absorption in wurtzite GaN,* Jpn. J. Appl. Phys., **Vol. 38** No. 2B, pp. L151-L153 (1999)

168. S. Nakamura, M. Senoh, S. Nagahama, T. Matsushita, H. Kiyoku, Y. Sugimoto, T. Kozaki, H. Umemoto, M. Sano, T. Mukai, *Violet InGaN/GaN/AlGaN-based laser diodes operable at 50˚ C with a fundamental transverse mode,* Jpn. J. Appl. Phys., **Vol. 38** No. 3A**,** pp. L226-L229 (1999)

169. S.F. Chichibu, H. Marchand, M.S. Minskey, S. Keller, P.T. Fini, J.P. Ibbetson, S.B. Feisher, J.S. Speck, J.E. Bowers, E. Hu, U.K. Mishra, S.P. DenBaars, T. Deguchi, T. Sota, S. Nakamura, *Emission mechanisms of bulk GaN and InGaN quantum wells prepared by lateral epitaxial overgrowth,* Appl. Phys. Lett., **Vol. 74** No. 10, pp. 1460-1462 (1999)

170. M. Yamaguchi, T. Yagi, T. Sota, T. Deguchi, K. Shimada, S. Nakamura, *Brillouin scattering study of bulk GaN,* J. Appl. Phys., **Vol. 85** No. 12, pp. 8502-8504 (1999)

171. S. Nakamura, *InGaN/GaN/AlGaN-based laser diodes grown on epitaxially laterally overgrown GaN,* J. Mater. Rsrch., **Vol. 14** No. 7, pp. 2716-2731 (1999)

172. K. Torii, T. Deguchi, T. Sota, K. Suzuki, S. Chichibu, S. Nakamura, *Reflectance and emission spectra of excitonic polaritons in GaN,* Phys. Rev. B, **Vol. 60** No. 7, pp. 4723-4730 (1999)

173. T. Deguchi, K. Torii, K. Shimada, T. Sota, R. Matsuo, M. Sugiyami, A. Setoguchi, S. Chichibu, S. Nakamura, *Optical properties of InGaN active layer in ultraviolet light-emitting diode,* Jpn. J. Appl. Phys., **Vol. 38** No. 9A/B, pp. L975-L977 (1999)

174. J.T. Torvik, J.I. Pankove, S. Nakamura, I. Grzegory, S. Porowski, *The effect of threading dislocations, Mg-doping, and etching on the spectral responsivity in GaN-based ultraviolet detectors,* J. Appl. Phys., **Vol. 86** No. 8, pp. 4588-4593 (1999)

175. T. Mukai, S. Nakamura, *Ultraviolet InGaN and GaN single-quantum-well-structure light-emitting diodes grown epitaxially laterally overgrown GaN substrates,* Jpn. J. Appl. Phys., **Vol. 38** No. 10, pp. 5735-5739 (1999)

176. S. Nakamura, *InGaN-based blue light-emitting diodes and laser diodes,* J. Cryst. Growth, **Vol. 201/202**, pp. 290-295 (1999)

177. S. Nakamura, *Present status of InGaN-based laser diodes,* Phys. Stat. Sol. (a), **Vol. 176** Issue 1, pp. 15-22 (1999)

178. S. Nakamura, *InGaN/GaN/AlGaN-based laser diodes grown on free-standing GaN substrates,* Mater. Sci. & Engin. B, **Vol. 59** Issue 1-3, pp. 370-375 (1999)

179. Y. Kamiura, Y. Yamashita, S. Nakamura, *Photo-enhanced dissociation of hydrogen-magnesium complexes in gallium nitride,* Physica B, **Vol. 273/274**, pp. 54-57 (1999)

180. H. Asahi, K. Iwata, H. Tampo, T. Kuroiwa, M. Hiroki, K. Asami, S. Nakamura, S. Gonda, *Very strong photoluminescence emission from GaN grown on amorphous silica, substrate by gas source MBE,* J. Cryst. Growth, **Vol. 201/202**, pp. 371-375 (1999)

181. S. Nakamura, *Blue light emitting laser diodes,* Thin Solid Films, **Vol. 343-344**, pp. 345-349 (1999)

182. S.F. Chichibu, A.C. Abare, M.P. Mack, M.S. Minsky, T. Deguchi, D. Cohen, P. Kozodoy, S.B. Fleisher, S. Keller, J.S. Speck, J.E. Bowers, E. Hu, U.K. Mishra, L.A. Coldren, S.P. DenBaars, K. Wada, T. Sota, S. Nakamura, *Optical properties of InGaN quantum wells,* Mater. Sci.& Engin. B, **Vol. 59** Issue 1-3, pp. 298-306 (1999)

183. S. Nakamura, *InGaN-based violet laser diodes,* Semicond, Sci. Technol., **Vol. 14** No. 6, pp. R27-R40 (1999)

184. S. Nakamura, *Development of violet InGaN-based laser diodes,* Jpn. Soc. Appl. Phys., **Vol. 68** No. 7, pp. 793-796 (1999)

185. T. Deguchi, D. Ichiryu, K. Toshikawa, K. Sekiguchi, T. Sota, R. Matsuo, T. Azuhata, M. Yamaguchi, T. Yagi, S. Chichibu, S. Nakamura, *Structural and vibrational properties of GaN,* J. Appl. Phys., **Vol. 86** No. 4, pp. 1860-1866 (1999)

186. T.J. Ochalski, B. Gil, P. Lefebvre, N. Grandjean, M. Leroux, J. Massies, S. Nakamura, H. Morkoc, *Photoreflectance investigations of the bowing parameter in AlGaN alloys lattice-matched to GaN,* Appl. Phys. Lett., **Vol. 74** No. 22, pp. 3353-3355 (1999)

187. Y. Narukawa, Y. Kawakami, Sg. Fujita, S. Nakamura, *Dimensionality of excitons in laser-diode structures composed of In(sub x)Ga(sub 1-x)N multiple quantum wells,* Phys. Rev. B, **Vol. 59** No. 15, pp. 10283-10288 (1999)

188. S. Nakamura, *Development of violet InGaN-based laser diodes,* Oyo Buturi, **Vol. 68** No. 7, pp. 793-796 (1999)

189. T. Azuhata, K. Shimada, T. Deguchi, T. Sota, R. Matsuo, M. Sugiyama, A. Setoguchi, S. Chichibu, S. Nakamura, *Optical properties of an InGaN active layer in ultraviolet light emitting diode,* Jpn. J. Appl. Phys., **Vol. 38** No. 9 A/B, pp. L975-L977 (1999)

190. T. Deguchi, K. Sekiguchi, A. Nakamura, T. Sota, R. Matsuo, S. Chichibu, S. Nakamura, *Quantum-confined Stark effect in an AlGaN/GaN/AlGaN single quantum well structure,* Jpn. J. Appl. Phys., **Vol. 38** No. 8B, pp. L914-L916 (1999)

191. T. Mukai, M. Yamada, S. Nakamura, *Characteristic of InGaN-based UV/blue/green/amber/red light emitting diode,* Jpn. J. Appl. Phys., **Vol. 38** No. 7A, pp. 3976-3981 (1999)

192. T. Mukai, S. Nakamura, *White and UV LEDs,* Oyo Buturi, **Vol. 68** No. 2, pp. 152-155 (1999)

193. Y. Narukawa, S. Saijou, Y. Kawakami, S. Fujita, T. Mukai, S. Nakamura, *Radiative and nonradiative recombination processes in ultraviolet light-emitting diode composed of an In/sub0.02/Ga/sub 0.98/N active layer,* Appl. Phys. Lett., **Vol. 74** No. 4, pp. 558-560 (1999)

194. S.F. Chichibu, K. Sota, K. Wada, S.P. DenBaars, S. Nakamura, *Spectroscopic studies in InGaN quantum wells,* MRS Internet Journal of Nitride Semiconductor Research, **Vol. 4s1**, 2.7 (1999)

195. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Matsushita, T. Mukai, *InGaN/GaN/AlGaN-based LEDs and laser diodes,* MRS Internet Journal of Nitride Semiconductor Research, **Vol. 4s1**, 1.1 (1999)

196. S.F. Chichibu, T. Deguchi, T. Sota, K. Wada, S.P. DenBaars, T. Mukai, S. Nakamura, *Properties of quantum well excitons in GaN/AlGaN and InGaN/GaN/AlGaN UV, blue, green, amber light emitting diode structures,* Phys. Stat. Sol., **Vol. 176** Issue 1, pp. 85-90 (1999)

197. T. Azuhata, K. Shimada, T. Deguchi, T. Sota, K. Suzuki, S. Chichibu, S. Nakamura, *Two-phonon absorption spectra in wurzite GaN,* Applied Physics Letters, **Vol. 75** No. 14, pp. 2076-2078 (1999)

198. T. A. Kennedy, E. R. Glaser, W. E. Carlos, P. P. Ruden, S. Nakamura, *Symmetry of electrons and holes in lightly photo-excited InGaN LEDs,* MRS Internet Journal of Nitride Semiconductor Research, **Vol. 4S1**, G7.4 (1999)

199. S. Nakamura, F. Chichibu, *Introduction to Nitride Semiconductor Blue Lasers and Light Emitting Diodes,* Taylor & Francis: London and New York (2000)

200. S. Nakamura, S. Pearton, G. Fasol, *The Blue Laser Diode (The Complete Story) 2nd Ed.,* Springer-Verlag: Heidelberg (2000)

201. S. Nakamura,. *InGaN-based laser diodes,* Japan Society of Applied Physics International, **No. 1** (2000)

202. S.F. Chichibu, K. Torii, T. Deguchi, T. Sota, A. Setoguchi., H. Nakanishi, T. Azuhata, S. Nakamura, *Photoreflectance spectra of excitonic polaritons in GaN substrate prepared by lateral epitaxial overgrowth,* Appl. Phys. Lett., **Vol. 76** No. 12, pp. 1576-1578 (2000)

203. S.F. Chichibu, K. Wada, J. Mullhauser, O. Brandt, K.H. Ploog, T. Mizutani, A. Setoguchi, R. Nakai, M. Sugiyama, H. Nakanishi, K. Torii, T. Deguchi, T. Sota, S. Nakamura, *Evidence of localization effects in InGaN single-quantum-well ultraviolet light-emitting diodes,* Appl. Phys. Lett., **Vol. 76** No. 13, pp. 1671-1673 (2000)

204. S.F. Chichibu, A. Shikanai, T. Deguchi, A. Setoguchi, R. Nakai, H. Nakanishi, K. Wada, S.P. DenBaars, T. Sota, S. Nakamura, *Comparison of optical properties of GaN/AlGaN and InGaN/AlGaN single quantum wells,* Jpn. J. Appl. Phys., **Vol. 39** No. 4B, pp. 2417-2424 (2000)

205. S. Nakamura, *Role of alloy fluctuations in InGaN-based LEDs and laser diodes,* Mater. Sci. Forum, **Vols. 338-342**, pp. 1609-1614 (2000)

206. S.F. Chichibu, A. Setoguchi, T. Azuhata, J. Mullhauser, M. Sugiyama, T. Mizutani, T. Deguchi, H. Nakanishi, T. Sota, O. Brandt, K.H. Ploog, T. Mukai, S. Nakamura, *Effective localization of quantum well excitons in InGaN quantum well structures with high InN mole fraction,* Phys. Stat. Sol. (a), **Vol. 180**, pp. 321-325 (2000)

207. S.F. Chichibu, T. Azuhata, T. Sota, T. Mukai, S. Nakamura, *Localized quantum well excitons in InGaN single-quantum-well amber light-emitting diodes,* J. Appl. Phys., **Vol. 88** No. 9, pp. 5153-5157 (2000)

208. S. Nakamura, *InGaN-based UV/blue/green LED and LD structure,* Handbook of Thin Film Devices, **Vol. 2** Semiconductor Optical and Electro-Optical Devices, pp. 225-263 (2000)

209. S. Nakamura, M. Senoh, S. Nagahama, N. Iwasa, T. Matsushita, T. Mukai, *Blue InGaN-based laser diodes with an emission wavelength of 450 nm,* Appl. Phys. Lett., **Vol. 76** No. 1, pp. 22-24 (2000)

210. T. Fujita, T. Hasegawa, M. Haraguchi, T. Okamoto, M. Fukui, S. Nakamura, *Determination of second-order nonlinear optical susceptibility of GaN films on sapphire,* Jpn. J. Appl. Phys., **Vol. 39** No. 5A, pp. 2610-2613 (2000)

211. S. Nakamura, *UV/blue/green InGaN-based LEDs and laser diodes grown on epitaxially laterally overgrown GaN,* IEICE Transactions on Electronics, **Vol. E83-C** No. 4, pp. 529-535 (2000)

212. P. Fischer, J. Christen, S. Nakamura, *Spectral electroluminescence mapping of a blue InGaN single quantum well light-emitting diode,* Jpn. J. Appl. Phys., **Vol. 39** No. 2B, pp. L129-L132 (2000)

213. A. Shikanai, T. Deguchi, T. Sota, T. Kuroda, A. Tackeuchi, S. Chichibu, S. Nakamura, *A pump and probe study of photoinduced internal field screening dynamics in an AlGaN/GaN single-quantum-well structure,* Appl. Phys. Lett., **Vol. 76** No. 4, pp. 454-456 (2000)

214. K. Torii, T. Koga, T. Sota, T. Azuhata, S.F. Chichibu, S. Nakamura, *An attenuated-total-reflection study on the surface phonon polariton in GaN,* J. Phys. Condens. Matter, **Vol. 12** No. 31, pp. 7041-7044 (2000)

215. K. Torii, M. Ono, T. Sota, T. Azuhata, S.F. Chichibu, S. Nakamura, *Raman scattering from phonon-polaritons in GaN,* Phys. Rev. B, **Vol. 62** No. 16, pp. 10861-10866 (2000)

216. T. Azuhata, M. Ono, K. Torii, T. Sota, S.F. Chichibu, S. Nakamura, *Forward Raman scattering by quasilongitudinal optical phonons in GaN,* Journal of Applied Physics, Vol. 88 No. 9, pp. 5202-5205 (2000)

217. M. Sumiya, S. Nakamura, S. F. Chichibu, K. Mizuno, M. Furusawa, M. Yoshimoto, *Structural analysis of In/sub x/Ga/sub 1-x/N single quantum wells by coaxial-impact collision ion scattering,* Appl. Phys. Lett., **Vol. 77** No. 16, pp. 2512-2514 (2000)

218. T. Izumi, Y. Narukawa, K. Okamoto, Y. Kawakami, S. Fujita, S. Nakamura, *Time-resolved photoluminescence spectroscopy in GaN-based semiconductors with micron spatial resolution,* J. Luminescence, **Vol. 87-89**, pp. 1196-1198 (2000)

219. H. Kudo, H. Ishibashi, R. S. Zheng, Y. Yamada, T. Taguchi, S. Nakamura, G. Shinomiya, *Ultraviolet emission properties in $In_xGa_{1-x}N$ epitaxial layer revealed by magnetoluminescence and time-resolved luminescence studies,* J. Luminescence, **Vol. 87-89**, pp. 1199-1201 (2000)

220. Y. Kawakami, Y. Narukawa, K. Omae, S. Fujita, S. Nakamura, *Dimensionality of exitons in InGaN-based light emitting devices,* Phys. Stat. Sol. A, **Vol. 178,** No. 1, pp. 331-336 (2000)

221. M. Yoshimoto, J. Saraie, S. Nakamura, *Low-temperature microscopic photoluminescence images of epitaxially laterally overgrown GaN,* Jpn. J. Appl. Phys.,**Vol. 40** P. 2 No. 4B**,** pp. L386-L388 (2001)

222. A. Uedono, S. F. Chichibu, Z. Q. Chen, M. Sumiya, R. Suzuki, T. Ohdaira, T. Mikado, T. Mukai, S. Nakamura, *Study of defects in GaN grown by the two-flow metalorganic chemical vapor deposition technique using monoenergentic positron beams,* J. Appl. Phys., **Vol. 90** No. 1, pp. 181-186 (2001)

223. K. Torii, S. F. Chichibu, T. Deguchi, H. Nakanishi, T. Sota, S. Nakamura, *Excitonic polariton structures in wurtzite GaN,* Physica B, **Vol. 302** No. 1, pp. 181-186 (2001)

224. S. F. Chichibu, T. Sota, K. Wada, O. Brandt, K. H. Ploog, S. P. DenBaars, S. Nakamura, *Impact of internal electric field and localization effect on quantum well excitons in AlGaN/GaN/InGaN light emitting diodes,* Physica Status Solidi A, **Vol. 183** No. 1, pp. 91-98 (2001)

225. S. F. Chichibu, K. Wada, J. Mullhauser, O. Brandt, K. H. Ploog, T. Mizutani, A. Setoguchi, R. Nakai, M. Sugiyama, H. Nakanishi, K. Torii, T. Deguchi, T. Sota, S. Nakamura, Evidence of localization effects in InGaN single-quantum-well ultraviolet light-emitting diodes, Appl. Phys. Lett., **Vol. 78** No. 5, p. 679 (2001)

226. Y. Kawakami, Y. Narukawa, K. Omae, S. Nakamura, S. Fujita, Pump and probe spectroscopy of InGaN multi-quantum well bases laser diodes, Materials Science and Engineering B, **Vol. 82** No. 1-3, pp. 188-193 (2001)

227. G. A. Sukach, P. S. Smertenko, P. F. Oleksenko, S. Nakamura, Analysis of the active region of overheating temperature in green LEDs based on group III nitrides, Technical Physics, **Vol. 46** No. 4**,** pp. 438-441 (2001)

228. S. F. Chichibu, K. Wada, J. Mullhauser, O. Brandt, K. H. Ploog, T. Mizutani, A. Setoguchi, R. Nakai, M. Sugiyama, H. Nakanishi, K. Torii, T. Deguchi, T. Sota, S. Nakamura, *Evidence of localization effects in InGaN single-quantum-well ultraviolet light-emitting diodes,* Appl. Phys. Lett., **Vol. 78** No. 5, p. 679 (2001)

229. Y. Kawakami, Y. Narukawa, K. Omae, S. Nakamura, S. Fujita, *Pump and probe spectroscopy of InGaN multi-quantum well bases laser diodes,* Materials Science and Engineering B, **Vol. 82** No. 1-3, pp. 188-193 (2002)

230. G. A. Sukach, P. S. Smertenko, P. F. Oleksenko, S. Nakamura, *Analysis of the active region of overheating temperature in green LEDs based on group III nitrides,* Technical Physics, **Vol. 46** No. 4, pp. 438-441 (2002)

231. S. F. Chichibu, M. Sugiyama, T. Kuroda, A. Tackeuchi, T. Kitamura, H. Nakanishi, T. Sota, S. P. DenBaars, S. Nakamura, Y. Ishida, H. Okumura, *Band gap bowing and exciton localization in strained cubic $In_xGa_{1-x}N$ films grown on 3C-SiC (001) by rf molecular-beam epitaxy,* Applied Physics Letters, **Vol. 79** No. 22, pp. 3600-3602 (2002)

232. E. R. Glaser, W. E. Carlos, G. C. B. Braga, J. A. Freitas, Jr., W. J. Moore, B. V. Shanabrook, A. E. Wickenden, D. D. Koleske, R. L. Henry, M. W. Bayerl, M. S. Brandt, H. Obloh, P. Kozodoy, S. P. DenBaars, U. K. Mishra, S. Nakamura, E. Haus, J. S. Speck, J. E. Van Nostrand, M. A. Sanchez, E. Calleja, A. J. Ptak, T. H. Meyers, R. J. Molnar, *Characterization of nitrides by electron paramagnetic resonance (EPR) and optically detected magnetic resonance (ODMR),* Mater. Sci. & Tech. B, **93**, 39-48 (2002)

233. S. F. Chichibu, T. Onuma, T. Kitamura, T. Sota, S. P. DenBaars, S. Nakamura, H. Okumura, *Recombination dynamics of localized excitons in cubic phase $In_xGa_{1-x}N$/GaN multiple quantum wells on 3C-SiC/Si (001),* Phys. Stat. Sol. B, **234** (3), 746-749 (2003)

234. M. Hansen, J. Piprek, P. M. Pattison, J. S. Speck, S. Nakamura, S. P. DenBaars, *Higher efficiency InGaN laser diodes with an improved quantum well capping configuration,* Appl. Phys. Lett., **81** (22): 4275-4277 (2003)

235. J. Piprek, S. Nakamura, *Physics of high-power InGaN/GaN lasers,* IEEE Proc.- Optoelec., **149** (4): 145-151 (2003)

236. S. F. Chichibu, T. Onuma, T. Sota, S. P. DenBaars, S. Nakamura, T. Kitamura, Y. Ishida, and H. Okumura, *Influence of InN mole fraction on the recombination processes of localized excitons in strained cubic $In_xGa_{1-x}N$/GaN multiple quantum wells,* J. Appl. Physics, **93** (4), 2051-2054 (2003)

237. S. F. Chichibu, T. Onuma, T. Aoyama, K. Nakajima, P. Ahmet, T. Chikyow, T. Sota, S. P. DenBaars, S. Nakamura, T. Kitamura, Y. Ishida, H. Okumura, *Recombination dynamics of localized excitons in cubic $In_xG_{1-x}N$/GaN multiple quantum wells grown by radio frequency molecular beam epitaxy on 3C-SiC substrate,* J. Vac. Sci. & Techno., **21** (4), 1856-1862 (2003)

238. B. A. Haskell, F. Wu, S. Matsuda, M. D. Craven, P. T. Fini, S. P. DenBaars, J. S. Speck, S. Nakamura, *Structural and morphological characteristics of planar (11$\underline{2}$0) a-plane gallium nitride grown by hydride vapor phase epitaxy,* Appl. Phys. Lett., **83** (8), 1554-1556 (2003)

239. B. A. Haskell, F. Wu, M. D. Craven, S. Matsuda, P. T. Fini, T. Fujii, K. Fujito, S. P. DenBaars, J. S. Speck, S. Nakamura, *Defect reduction in (11$\underline{2}$0) a-plane gallium nitride via lateral epitaxial overgrowth by hydride vapor-phase epitaxy,* Appl. Phys. Lett., **83** (4), 644-646 (2003)

240. T. Onuma, S. F. Chichibu, A. Uedono, T. Sota, P. Cantu, T. M. Katona, J. F. Kaeding, S. Keller, U. K. Mishra, S. Nakamura, S. P. DenBaars, *Radiative and nonradiative processes in strain free $Al_xGa_{1-x}N$ films studied by time-resolved photoluminescence and positron annihilation techniques,* J. Appl. Phys., **95** (5), 2495-2504 (2004)

241. T. Fujii, Y. Gao, R. Sharma, E. L. Hu, S. P. DenBaars, S. Nakamura, *Increase in the extraction efficiency of GaN-based light-emitting diodes via surface roughening,*Appl. Phys. Lett., **84** (6), 855-857 (2004)

242. Y. Wu, A. Hanlon, J.F. Kaeding, R. Sharma, P.T. Fini, S. Nakamura, J.S. Speck, *Effect of nitridation on polarity, microstructure, and morphology of A1N films,* Appl. Phys. Lett., **84** (6), 912-914 (2004)

243. P.R. Tavernier, T. Margalith, J. Williams, D.S. Green, S. Keller, S.P. DenBaars, U.K. Mishra, S. Nakamura, D.R. Clarke, *The growth of N-face GaN by MOCVD: effect of Mg, Si, and In,* J.of Cryst. Growth **264**, 150-158 (2004)

244. T. Fujii, A. David, C. Schwach, P.M. Pattison, R. Sharma, K. Fujito, T. Margalith, S.P. DenBaars, C. Weisbuch, S. Nakamura, *Micro Cavity Effect in GaN-Based Light-Emitting Diodes Formed by Laser Lift-Off and Etch-Back Technique,* Jpn. J. of Appl. Phys., **43**(3B), L411-413 (2004)

245. T. Koida, S.F. Chichibu, T. Sota, M.D. Craven, B.A. Haskell, J.S. Speck, S.P. DenBaars, S. Nakamura, *Improved quantum efficiency in nonpolar (11$\underline{2}$0) A1GaN/GaN quantum wells grown on GaN prepared by lateral epitaxial overgrowth,* Appl. Phys. Lett, **84** (19), 3768-3770 (2004)

246. Y. Gao, T. Fujii, R. Sharma, K. Fujito, S.P. DenBaars, S. Nakamura, E.L. Hu, *Roughening Hexagonal Surface Morphology on Laser Lift-Off (LLO) N- Face GaN with Simple Photo-Enhanced Chemical Wet Etching,* Jpn. J. of Appl. Phys., **43** (5A), L637-639 (2004)

247. M. McLaurin, B. Haskell, S. Nakamura, J.S. Speck, *Gallium adsorption onto (11$\underline{2}$0) gallium nitride surfaces,* J. of Appl. Phys., **96** (1), 327-334 (2004)

248. E.D. Haberer, R. Sharma, A.R. Stonas, S. Nakamura, S.P. DenBaars, E.L. Hu, *Removal of thick (>100 nm) InGaN layers for optical devices using band-gap-selective photoelectrochemical etching,* Appl. Phys. Lett., **85** (5), 762-764 (2004)

249. T. Koida, Y. Uchinuma, J. Kikuchi, K.R. Wang, M. Terazaki, T. Onuma, J.F. Kaeding, R. Sharma, S. Nakamura, S.F. Chichibu, *Improved surface morphology in GaN homoepitaxy y NH_3-source molecular-beam epitaxy,* J. Vac. Sci. Tech. B, **22** (4), 2158-2164 (2004)

250. J.F. Kaeding, Y. Wu, T. Fujii, R. Sharma, P.T. Fini, J.S. Speck, S. Nakamura. *Growth and laser-assisted liftoff of low dislocation density A1N thin films for deep-UV light- emitting diodes,* J. of Crys. Growth, **272**, 257-263 (2005)

251. K. Fujito, T. Hashimoto, K. Samonji, J.S. Speck, S. Nakamura, *Growth of A1N by the chemical vapor reaction process and its application to lateral overgrowth on patterned sapphire substrates,* J. of Crystal Growth, **272**, 370-376 (2005)

252. E.D. Haberer, R. Sharma, C. Meier, A.R. Stonas, S. Nakamura, S.P. DenBaars, E.L. Hu, *Free-standing, optically pumped, GaN/InGaN microdisk lasers fabricated by photoelectrochemical etching,* Appl. Phys. Lett., **85** (22), 5179-5181 (2005)

253. A. Chakraborty, B.A. Haskell, S. Keller, J.S. Speck, S.P. DenBaars, S. Nakamura, U.K. Mishra, *Nonpolar InGaN/GaN emitters on reduced-defect lateral epitaxially overgrown a-plane GaN with drive-current-independent electroluminescence emission peak,* Appl. Phys. Lett, **85** (22), 5143-5145 (2005)

254. A. Chakraborty, S. Keller, C. Meier, B.A. Haskell, S. Keller, P. Waltereit, S.P. DenBaars, S. Nakamura, J.S. Speck, U.K. Mishra, *Properties of nonpolar a-plane InGaN/GaN multiple quantum wells grown on lateral epitaxially overgrown a-plane GaN,* Appl. Phys. Lett., 86, 031901 (2005)

255. B.A. Haskell, T.J. Baker, M.D. McLaurin, F. Wu, P.T. Fini, S.P. DenBaars, J.S. Speck, S. Nakamura, *Defect reduction in (1100) m-plane gallium nitride via lateral epitaxial overgrowth by hydride vapor phase epitaxy,* Appl. Phys. Lett., **86**, 111917 (2005)

256. B.A. Haskell, A. Chakraborty, F. Wu, H. Sasano, P.T. Fini, S.P. DenBaars, J.S. Speck, S. Nakamura, *Microstructure and Enhanced Morphology of Planar Nonpolar m-Plane GaN Grown by Hydride Vapor Phase Epitaxy,* J. of Elec. Mater., **43** (4) 357-360 (2005)

257. G.A. Garrett, H. Shen, M. Wraback, B. Imer, B. Haskell, J.S. Speck, S. Keller, S. Nakamura, S.P. DenBaars, *Intensity dependent time-resolved photoluminescence studies of GaN/A1GaN multiple quantum wells of varying well width on laterally overgrown a-plane and planar c-plane GaN,* Phys. Stat. Sol.A **202** (5), 846-849 (2005)

258. T. Onuma, A. Chakraborty, B.A. Haskell, S. Keller, S.P. DenBaars, J.S. Speck, S. Nakamura, U.K. Mishra, *Localized exciton dynamics in nonpolar (1120) $In_xGa_{1-x}N$ multiple quantum wells grown on GaN templates prepared by lateral epitaxial overgrowth,* Appl. Phys. Lett., **86**, 151918 (2005)

259. T. Hashimoto, K. Fujito, K. Samonji, J.S. Speck, S. Nakamura, *Growth of AlN by the chemical vapor reaction process,* Jpn. J. of Appl. Phys., **44** (2), 869-873 (2005)

260. A. Chakraborty, B.A. Haskell, S. Keller, J.S. Speck, S.P. DenBaars, S. Nakamura, U.K. Mishra, *Demonstration of nonpolar m-plane InGaN/GaN light-emitting diodes on free-standing m-plane GaN substrates,* Jpn. J. of Appl. Phys., **44** (5), L173-L175 (2005)

261. R. Sharma, E.D. Haberer, C. Meier, E.L. Hu, S. Nakamura, *Vertically oriented GaN-based air-gap distributed Bragg reflector structure fabricated using band-gap-selective photoelectrochemical etching,* Appl. Phys. Lett., **87**, 051107 (2005)

262. T. Hashimoto, K. Fujito, F. Wu, B.A. Haskell, P.T. Fini, J.S. Speck, S. Nakamura, *Structural characterization of thick GaN films grown on free-standing GaN seeds by the ammonothermal method using basic ammonia,* Jpn. J. of Appl. Phys., **44** (25), L797-L799 (2005)

263. S. Ghosh, P. Misra, H.T. Grahn, B. Imer, S. Nakamura, S.P. DenBaars, J.S. Speck, *Polarized photoreflectance spectroscopy of strained A-plane GaN films on R-plane sapphire,* J. of Appl. Phys., **98**, 026105 (2005)

264. A. Chakraborty, T.J. Baker, B.A. Haskell, F. Wu, J.S. Speck, S.P. DenBaars, S. Nakamura, U.K. Mishra, *Milliwatt power blue InGaN/GaN light-emitting diodes on semipolar GaN templates,* Jpn. J. of Appl. Phys., **44** (30), L945-L947 (2005)

265. T.J. Baker, B.A. Haskell, F. Wu, P.T. Fini, J.S. Speck, S. Nakamura, *Characterization of planar semipolar gallium nitride films on spinel substrates,* Jpn. J. of Appl. Phys., **44** (29), L920-L922 (2005)

266. A. David, C. Meier, R. Sharma, F.S. Diana, S.P. DenBaars, E. Hu, S. Nakamura, C. Weisbuch, H. Benisty, *Photonic bands in two-dimensionally patterned multimode GaN waveguides for light extraction,* Appl. Phys. Lett., **87**, 101107 (2005)

267. H. Masui, A. Chakraborty, B.A. Haskell, U.K. Mishra, J.S. Speck, S. Nakamura, S.P. DenBaars, *Polarized light emission from nonpolar InGaN light-emitting diodes grown on a bulk m-plane GaN substrate,* Jpn. J. of Appl. Phys., **44** (43), L1329-L1332 (2005)

268. R. Sharma, P.M. Pattison, H. Masui, R.M. Farrell, T.J. Baker, B.A. Haskell, F. Wu, S.P. DenBaars, J.S. Speck, S. Nakamura, *Demonstration of a semipolar (1013) InGaN/GaN green light emitting diode,* Appl. Phys. Lett., **87**, 231110 (2005)

269. Y.S. Choi, K. Hennessy, R. Sharma, E. Haberer, Y. Gao, S.P. DenBaars, S. Nakamura, E.L. Hu, C. Meier. *GaN blue photonic crystal membrane nanocavities,* Appl. Phys. Lett., **87**, 243101 (2005)

270. T. Hashimoto, K. Fujito, M. Saito, J.S. Speck, S. Nakamura, *Ammonothermal growth of GaN on an over-1-inch seed crystal,* Jpn. J. of Appl. Phys. , **44** (52), L1570-L1572 (2005)

271. C. Meier, K. Hennessy, E.D. Haberer, R. Sharma, Y.S. Choi, K. McGroddy, S. Keller, S.P. DenBaars, S. Nakamura, E.L. Hu, *Visible resonant modes in GaN-based photonic crystal membrane cavities,* Appl. Phys. Lett., **88**, 031111 (2006)

272. A. David, T. Fujii, E. Matioli, R. Sharma, S. Nakamura, S.P. DenBaars, C. Weisbuch, H. Benisty, *GaN light-emitting diodes with Archimedean lattice photonic crystals,* Appl. Phys. Lett., **88**, 073510 (2006)

273. A. David, T. Fujii, R. Sharma, K. McGroddy, S. Nakamura, S.P. DenBaars, E.L. Hu, C. Weisbuch, H. Benisty, *Photonic-crystal GaN light-emitting diodes with tailored guided modes distribution,* Appl. Phys. Lett., **88**, 061124 (2006)

274. A. Chakraborty, B.A. Haskell, H. Masui, S. Keller, J.S. Speck, S.P. DenBaars, S. Nakamura, U.K. Mishra, *Nonpolar m-plane blue-light-emitting diode lamps with output power of 23.5 mW under pulsed operation,* Jpn. J. of Appl. Phys., **45** (2A), 739-741 (2006)

275. I. Waki, M. Iza, J.S. Speck, S.P. DenBaars, S. Nakamura, *Etching of Ga-face and N-face GaN by inductively coupled plasma,* Jpn. J. of Appl. Phys., **45**(2A), 720-723 (2006)

276. J. Piprek, R. Farrell, S.P. DenBaars, S. Nakamura, *Effects of built-in polarization on InGaN-GaN vertical-cavity surface-emitting lasers,* IEEE Photonics Technology Letters, **18** (1), 7-9 (2006)

277. T.J. Baker, B.A. Haskell, F. Wu, J.S. Speck, S. Nakamura, *Characterization of planar semipolar gallium nitride films on sapphire substrates,* Jpn. J. of Appl. Phys., **45** (6), L154-L157 (2006)

278. T. Onuma, S. Keller, S.P. DenBaars, J.S. Speck, S. Nakamura, U.K. Mishra, T. Sota, S.F. Chichibu, *Recombination dynamics of a 268 nm emission peak in $Al_{0.53}In_{0.11}Ga_{0.36}N/Al_{0.58}In_{0.02}Ga_{0.40}N$ multiple quantum wells,* Appl. Phys. Lett., **88**, 111912 (2006)

279. A. David, T. Fujii, B. Moran, S. Nakamura, S.P. DenBaars, C. Weisbuch, H. Benisty, *Photonic crystal laser lift-off GaN light-emitting diodes,* Appl. Phys. Lett., **88**, 133514 (2006)

280. P. Misra, U. Behn, O. Brandt, H.T. Grahn, B. Imer, S. Nakamura, S.P. DenBaars, J.S. Speck, *Polarization anisotropy in GaN films for different nonpolar orientations studied by polarized photoreflectance spectroscopy,* Appl. Phys. Lett., **88**, 161920 (2006)

281. Pattison PM, Sharma R, David A, Waki I, Weisbuch C, Nakamura S., *Gallium nitride based micro-cavity light emitting diodes emitting at 498 nm,* Phys. Stat. Sol. A **203** (7), 1783-1786 (2006)

282. C. Roder, S. Einfeldt, S. Figge, D. Hommel, T. Paskova, B. Monemar, B.A. Haskell, P.T. Fini, J.S. Speck, S. Nakamura, *Strain in a-plane GaN layers grown on r-plane sapphire substrates,* Phys. Stat. Sol. A **203** (7): 1672-1675 (2006)

283. T. Koyama, M. Sugawara, Y. Uchinuma, J.F. Kaeding, R. Sharma, T. Onuma, S. Nakamura, S.F. Chichibu, *Strain-relaxation in NH_3-source molecular beam epitaxy of AlN epilayers on GaN epitaxial templates,* Phys. Stat. Sol. A **203** (7), 1603-1606 (2006)

284. T. Hashimoto, K. Fujito, R. Sharma, E.R. Letts, P.T. Fini, J.S. Speck, S. Nakamura, *Phase selection of microcrystalline GaN synthesized in supercritical ammonia,* J. of Crystal Growth, **291**, 100-106 (2006)

285. F.S. Diana, A. David, I. Meinel, R. Sharma, C. Weisbuch, S. Nakamura, P.M. Petroff, *Photonic crystal-assisted light extraction from a colloidal quantum dot/GaN hybrid structure,* Nano Lett. **6** (6), 1116-1120 (2006)

286. Ghosh S, Misra P, Grahn HT, Imer B, Nakamura S, DenBaars SP, Speck JS., *Optical polarization anisotropy in strained A-plane GaN films on R-plane sapphire,* Phys. Stat. Sol. B, **243** (7): 1441-1445 (2006)

287. Kaeding JF, Iza M, Sato H, DenBaars SP, Speck JS, Nakamura S., *Effect of Substrate Miscut on the Direct Growth of Semipolar (10$\underline{1}$1) GaN on (100) $MgAl_2O_4$ by Metalorganic Chemical Vapor Deposition,* Jpn. J. Appl. Phys., **45,** (21): L536–L538 (2006)

288. Onuma T, Chakraborty A, Haskell A, Keller S, Sota T, Mishra UK, DenBaars SP, Speck JS, Nakamura S, Chichibu SF., *Exciton dynamics in nonpolar (11$\underline{2}$0) InGaN/GaN multiple quantum wells grown on GaN templates prepared by lateral epitaxial overgrowth,* Phys. Stat. Sol. C, **3,** (6) 2082–2086 (2006)

289. Paskov PP, Schifano R, Malinauskas T, Paskova T, Bergman JP, Monemar B, Figge S, Hommel D, Haskell BA, Fini PT, Speck JS, Nakamura S, *Photoluminescence of a-plane GaN: comparison between MOCVD and HVPE grown layers,* Phys. Stat. Sol. C, **3,** (6) 1499–1502 (2006)

290. A. Romanov, T.Baker, S. Nakamura, J. Speck, *Strain-induced polarization in wurtzite III-nitride semipolar layers,* Journal of Applied Physics **100,** 023522 (2006)

291. R. Sharma, P. M. Pattison, T. Baker, B. Haskell, R. Farrell, H. Masui, F. Wu, S. DenBaars, J. Speck, S. Nakamura, *A semipolar (10$\bar{1}$3) InGaN/GaN green light emitting diode*, Materials Research Society Symposium Proceedings **892**, 0892-FF0719-02.1-6 (2006)

292. A. Chakraborty, T. Onuma, T. Baker, S. Keller, S. Chichibu, S. DenBaars, S. Nakamura, U. Mishra, *Growth and characterization of semipolar InGaN/GaN multiple quantum wells and light emitting diodes on (10$\bar{1}\bar{1}$) GaN templates*, Materials Research Society Symposium Proceedings **892**, 0892-FF07-09-EE05-09.1-6 (2006)

293. P.P. Paskov, T. Paskova, B. Monemar, S. Figge, D. Hommel, B.A. Haskell, P.T. Fini, J.S. Speck and S. Nakamura, *Optical properties of nonpolar a-plane GaN layers,* Superlattices and Microstructures **40,** 253-261 (2006)

294. H. Masui, T. Baker, R. Sharma, P. Pattison, M. Iza, H. Zhong, S. Nakamura and S. DenBaars, *First-Moment Analysis of Polarized Light Emission from InGaN/GaN Light-Emitting Diodes Prepared on Semipolar Planes,* Japanese Journal of Applied Physics **45,** No 34 L904-L906 (2006)

295. H. Masui, S. Nakamura and S. DenBaars, *Effects of Phosphor Application Geometry on White Light-Emitting Diodes,* Japanese Journal of Applied Physics **45,** No 34 L910-L912 (2006)

296. T. Koyama, T. Onuma, H. Masui, A. Chakraborty, B. A. Haskell, S. Keller, U. K. Mishra, J. S. Speck, S. Nakamura, S. P. DenBaars, T. Sota, and S. F. Chichibu, *Prospective emission efficiency and in-plane light polarization of nonpolar m-plane $In_xGa_{1-x}N$/GaN blue light emitting diodes fabricated on freestanding GaN substrates,* Applied Physics Letters **89,** 091906 (2006)

297. A. Murai, D. Thompson, C.Y. Chen, U. Mishra, S. Nakamura and S. DenBaars, *Light-Emitting Diode Based on ZnO and GaN Direct Wafer Bonding,* Japanese Journal of Applied Physics **45,** No 39 L1045-L1047 (2006)

298. A. Murai, D. Thompson, H. Masui, N. Fellows, U. Mishra, S. Nakamura, and S. DenBaars, *Hexagonal pyramid shaped light-emitting diodes based on ZnO and GaN direct wafer bonding,* Applied Physics Letters **89,** 171116 (2006)

299. H. Masui, M. Schmidt, A. Chakraborty, S. Nakamura and S. DenBaars, *Electroluminescent and Electrical Characteristics of Polar and Nonpolar InGaN/GaN Light-Emitting Diodes at Low Temperature,* Japanese Journal of Applied Physics **45,** No 10A 7661-7666 (2006)

300. S. Chichibu, A. Uedono, T. Onuma, B. Haskell, A. Chakrabort, T. Koyama, P. Fini, S. Keller, S. DenBaars, J. Speck, U. Mishra, S. Nakamura, S. Yamaguchi, S. Kamiyama, H. Amano, I. Akasaki, J. Han and T. Sota, *Origin of defect-insensitive emission probability in In-containing (Al,In,Ga)N alloy semiconductors,* Nature Materials **5,** 810-816 (2006)

301. A. Chakraborty, K. C. Kim, F. Wu, B. Haskell, S. Keller, J. Speck, S. Nakamura, S. DenBaars and U. Mishra, *Structural and Electroluminescence Characteristics of Nonpolar Light-Emitting Diodes Fabricated on Lateral Epitaxially Overgrown a-Plane GaN,* Japanese Journal of Applied Physics **45,** No 11 8659-8661 (2006)

302. J. F. Kaeding, H. Asamizu, H. Sato, M. Iza, T. E. Mates, S. P. DenBaars, J. S. Speck, and S. Nakamura, *Realization of high hole concentrations in Mg doped semipolar (10$\bar{1}$1) GaN,* Applied Physics Letters **89,** 020104 (2006)

303. D. Kamber, Y. Wu, B. Haskell, S. Newman, S. DenBaars, J. Speck and S. Nakamura, *Direct heteroepitaxial growth of thick AlN layers on sapphire substrates by hydride vapor phase epitaxy,* Journal of crystal Growth **297,** 321-325 (2006)

304. H. Masui, T. Baker, M. Iza, H. Zhong, S. Nakamura, and S. DenBaars, *Light-polarization characteristics of electroluminescence from InGaN/GaN light-emitting diodes prepared on (11$\bar{2}$2)-plane GaN,* Journal of Applied Physics **100,** 113109 (2006)

305. C. Roder, S. Einfeldt, S. Figge, T. Paskova, D. Hommel, P. Paskov, B. Monemar, U. Behn, B. Haskell, P. Fini, and S. Nakamura, *Stress and wafer bending of* a-*plane GaN layers on* r-*plane sapphire substrates,* Journal of Applied Physics **100**, 103511 (2006)

306. Y.S. Choi, C. Meier, R. Sharma, K. Hennessy, E. Haberer, S. Nakamura, and E. Hu, *Optical properties of GaN Photonic Crystal Membrane Nanocavities at Blue Wavelengths,* Materials Research Society Symposium Proceedings **892,** 0892-FF20-06.1 (2007)

307. V. Darakchieva T. Paskova, M. Schubert, P. Paskov, H. Arwin, B. Monemar, D. Hommel, M. Heuken, J. Off, B. Haskell, P.T. Fini, J. Speck and S. Nakamura, *Effect of anisotropic strain on phonons in a-plane and c-plane GaN layers,* Journal of Crystal Growth **300,** 233-238 (2007)

308. T. Hashimoto, M. Saito, K. Fujito, F. Wu, J. Speck, S. Nakamura, *Seeded Growth of GaN by the Basic Ammonothermal Method,* Journal of Crystal Growth **305,** 311-316 (2007)

309. R. Sharma, Y.S. Choi, C.F. Wang, A. David, C. Weisbuch, S. Nakamura, E. Hu, *Gallium-Nitride-Based Microcavity Light-Emitting Diodes with Air-Gap Distributed Bragg Reflectors,* Applied Physics Letters **91,** 211108 (2007)

310. S. Chichibu, T. Onuma, T. Hashimoto, K. Fujito, F. Wu, J. Speck, S. Nakamura, *Impacts of Dislocation Bending and Impurity Incorporation on the Local Cathodoluminescence Spectra of GaN Grown by Ammonothermal Method,* Applied Physics Letters **91,** 251911 (2007)

311. T. Koyama, M. Sugawara, T. Hoshi, A. Uedono J. Kaeding, R. Sharma, S. Nakamura, S. Chichibu, *Relation between Al vacancies and deep emission bands in AlN epitaxial films grown by NH3-source molecular beam epitaxy,* Applied Physics Letters **90,** 241914 (2007)

312. P. Morgan Pattison, A. David, R. Sharma, C. Weisbuch, S. DenBaars, and S. Nakamura, *Gallium nitride based microcavity light emitting diodes with 2λ effective cavity thickness,* Applied Physics Letters **90,** 031111 (2007)

313. U. Behn, P. Misra, H. Grahn, B. Imer, S. Nakamura, S. DenBaars, J. Speck, *Polarization anisotropy in nonpolar oriented GaN films studied by polarized photoreflectance spectroscopy,* Phys. Stat. Sol A **204,** No 1 299-303 (2007)

314. A. Chakraborty, B. Haskell, F. Wu, S. Keller, S. DenBaars, S. Nakamura, J. Speck, and U. Mishra, *Structural and Optical Properties of Nonpolar InGaN/GaN Multiple Quantum Wells Grown on Planar and Lateral Epitaxially Overgrown m-Plane GaN Films,* Japanese Journal of Applied Physics **46,** No 2 542-546 (2007)

315. A. Tyagi, H. Zhong, N. Fellows, M. Iza, J. Speck, S. DenBaars, and S. Nakamura, *High Brightness Violet InGaN/GaN Light Emitting Diodes on Semipolar (1011) Bulk GaN Substrates,* Japanese Journal of Applied Physics **46,** No 7 L129-L131 (2007)

316. M. Schmidt, K.C. Kim, H. Sato, N. Fellows, H. Masui, S. Nakamura, S. DenBaars, and J. Speck, *High Power and High External Efficiency m-Plane InGaN Light Emitting Diodes,* Japanese Journal of Applied Physics **46,** No 7 L126-L128 (2007)

317. A. Tamboli, E. Haberer, R. Sharma, K. Lee, S. Nakamura, E. Hu, *Room Temperature Continuous-Wave Lasing in GaN/InGaN Microdisks,* Nature Photonics **1,** 61-64 (2007)

318. D. Kamber, Y. Wu, E. Letts, S. DenBaars, J. Speck, S. Nakamura, and S. Newman, *Lateral epitaxial overgrowth of aluminum nitride on patterned silicon carbide substrates by hydride vapor phase epitaxy,* Applied Physics Letters **90,** 122116 (2007)

319. A. Hirai, B. A. Haskell, M. B. McLaurin, F. Wu, M. C. Schmidt, K. C. Kim, T. J. Baker, S. P. DenBaars, S. Nakamura, and J. S. Speck, *Defect-mediated surface morphology of nonpolar m-plane GaN,* Applied Physics Letters **90,** 121119 (2007)

320. M. Schmidt, K.C. Kim, R. Farrell, D. Feezell, D. Cohen, M. Saito, K. Fujito, J. Speck, S. DenBaars, and S. Nakamura, *Demonstration of Nonpolar m-Plane InGaN/GaN Laser Diodes,* Japanese Journal of Applied Physics **46,** No 9 L190-L191 (2007)

321. D. Feezell, M. Schmidt, R. Farrell, K.C. Kim, M. Saito, K. Fujito, D. Cohen, J. Speck, S. DenBaars, and S. Nakamura, *AlGaN-Cladding-Free Nonpolar InGaN/GaN Laser Diodes,* Japanese Journal of Applied Physics **46,** No 13 L284-L286 (2007)

322. D. F. Feezell, R. M. Farrell, M. C. Schmidt, H. Yamada, M. Ishida, S. P. DenBaars, D. A. Cohen, and S. Nakamura, *Thin metal intracavity contact and lateral current-distribution scheme for GaN-based vertical-cavity lasers,* Applied Physics Letters **90,** 181128 (2007)

323. V. Darakchieva, T. Paskova, M. Schubert, H. Arwin, P. Paskov, B. Monemar, D. Hommel, M. Heuken, J. Off, F. Scholz, B. Haskell, J. Speck, P. Fini, S. Nakamura, *Anisotropic Strain and Phonon deformation Potentials in GaN,* Physical Review B **75,** 195217 (2007)

324. K.C. Kim, M. Schmidt, H. Sato, F. Wu, N. Fellows , M. Saito, K. Fujito, J. Speck, S. Nakamura, S. DenBaars, *Improved electroluminescence on nonpolar m -plane InGaN/GaN quantum wells LEDs,* Phys Stat Sol (RRL)**1,** No 3 125-127 (2007)

325. A. Tyagi, H. Zhong, R. Chung, D. Feezell, M. Saito, K. Fujito, J. Speck, S. DenBaars, and S. Nakamura, *Semipolar (1011) InGaN/GaN Laser Diodes on Bulk GaN Substrates,* Japanese Journal of Applied Physics **46,** No 19 L444-L445 (2007)

326. H. Zhong, A. Tyagi, N. Fellows, F. Wu, R. Chung, M. Saito, K. Fujito, J. Speck, S. DenBaars, S. Nakamura, *High power and high efficiency blue light emitting diode on freestanding semipolar (10$\bar{1}\bar{1}$) bulk GaN substrate,* Applied Physics Letters **90,** 233504 (2007)

327. T. Hashimoto, F. Wu, J. Speck, and S. Nakamura, *Growth of Bulk GaN with Low Dislocation Density by the Ammonothermal Method Using Polycrystalline GaN Nutrient,* Japanese Journal of Applied Physics **46,** No 22 L525-L527 (2007)

328. H. Zhong, A. Tyagi, N. Fellows, R. Chung, M. Saito, K. Fujito, J. Speck, S. DenBaars, S. Nakamura, *Demonstration of high power blue-green light emitting diode on semipolar (1122) bulk GaN substrate,* IEEE Electronics Letters **43,** No 15 825-826 (2007)

329. H. Sato, A. Tyagi, H. Zhong, N. Fellows, R. Chung, M. Saito, K. Fujito, S. DenBaars, S. Nakamura, *High power and high efficiency green light emitting diode on free-standing semipolar (11$\bar{2}$2) bulk GaN substrate,* Phys Stat Sol (RRL) **1,** No 4 162-164 (2007)

330. T. Onuma, T. Koyama, A. Chakraborty, M. McLaurin, B. Haskell, P. Fini, S. Keller, S. DenBaars, J. Speck, U. Mishra, S. Nakamura, T. Sota, S. Chichibu, *Radiative and nonradiative lifetimes in nonpolar m-plane $In_xGa_{1-x}N$/GaN multiple quantum wells grown on GaN templates prepared by lateral epitaxial overgrowth,* Journal of Vacuum Science and Technology B **25,** No 4 1524-1528 (2007)

331. H. Masui, H. Sato, H. Asamizu, M. Schmidt, N. Fellows, S. Nakamura, and S. DenBaars, *R adiative Recombination Efficiency of InGaN-Based Light-Emitting Diodes Evaluated at Various Temperatures and Injection Currents,* Japanese Journal of Applied Physics **46,** No 25 L627-L629. (2007)

332. H. Masui, N. Fellows, H. Sato, S. Nakamura, S. DenBaars, *Direct Evaluation of reflector effects on radiant flux from InGaN-based light-emitting diodes,* Applied Optics **46,** No 23 5974-5978 (2007)

333. B.A. Haskell, S. Nakamura, S. P. DenBaars , J. S. Speck, *Progress in the growth of nonpolar gallium nitride,* Phys Stat Sol B **244,** No 8 2847-2858 (2007)

334. T. Hashimoto, F. Wu, J. Speck, S, Nakamura, *A GaN bulk crystal with improved structural quality grown by the ammonothermal method,* Nature Materials **6,** 568-571 (2007)

335. R. Farrell, D. Feezell, M. Schmidt, D. Haeger, K. Kelchner, K. Iso, H. Yamada, M. Saito, K. Fujito, D. Cohen, J. Speck, S. DenBaars, and S. Nakamura, *Continuous-wave Operation of AlGaN-cladding-free Nonpolar m-Plane InGaN/GaN Laser Diodes,* Japanese Journal of Applied Physics **46,** No 32 L761-L763 (2007)

336. S. F. Chichibu, A. Uedono, T. Onuma, B. A. Haskell, A. Chakraborty, T. Koyama, P. T. Fini, S. Keller, S. P. Denbaars, J. S. Speck, U. K. Mishra, S. Nakamura, S. Yamaguchi, S. Kamiyama, H. Amano, I. Akasaki, J. Han, T. Sota, *Origin of localized excitons in In-containing three-dimensional bulk (Al,In,Ga)N alloy films probed by time-resolved photoluminescence and monoenergetic positron annihilation techniques,* Philosophical Magazine **87**, No 13 2019-2039 (2007)

337. A. Murai, D. Thompson, H. Masui, N. Fellows, U. Mishra, S. Nakamura, S. DenBaars, *Mega-Cone Blue LEDs Based on ZnO/GaN Direct Wafer Bonding,* Phys Stat Sol C **4,** No 7 2756-2759 (2007)

338. I. Waki, D. Cohen, R. Lal, U. Mishra, S. DenBaars, S. Nakamura, *Direct Water Photoelectrolysis with Patterned n-GaN,* Applied Physics Letters **91,** 093519 (2007)

339. K. Fujii, Y. Iwaki, H. Masui, T. Baker, M. Iza, H. Sato, J. Kaeding, T. Yao, J. Speck, S. DenBaars, S. Nakamura, and K. Ohkawa, *Photoelectrochemical Properties of Nonpolar and Semipolar GaN,* Japanese Journal of Applied Physics **46,** No 10 A 6573-6578 (2007)

340. D. Feezell, S. Nakamura, S. DenBaars, J. Speck, *Nonpolar gallium nitride laser diodes are the next new blue,* Laser Focus World October Issue 79-83 (2007)

.

341. K. Iso, H. Yamada, H. Hirasawa, N. Fellows, M. Saito, K. Fujito, S. DenBaars, J. Speck, and S. Nakamura, *High Brightness Blue InGaN/GaN Light Emitting Diode on Nonpolar m-plane Bulk GaN Substrate,* Japanese Journal of Applied Physics **46,** No 40 L960-L962 (2007)

342. T. Hashimoto, F.Wu, J. Speck, and S. Nakamura, *Growth of Bulk GaN Crystals by the Basic Ammonothermal Method,* Japanese Journal of Applied Physics **46,** No 37 L889-L891 (2007)

343. K.C. Kim, M. Schmidt, H. Sato, F. Wu, N. Fellows, Z. Jia, M. Saito, S. Nakamura, S. DenBaars, J. Speck and K. Fujito, *Study of nonpolar m-plane InGaN/GaN multiquantum well light emitting diodes grown by homoepitaxial metal-organic chemical vapor deposition,* Applied Physics Letters **91,** 181120 (2007)

344. A. Hirai, Z. Jia, M. C. Schmidt, R. M. Farrell, S. P. DenBaars, S. Nakamura, J. S. Speck, and K. Fujito, *Formation and reduction of pyramidal hillocks on m-plane {1100} GaN,* Applied Physics Letters **91,** 191906 (2007)

345. H. Masui, M. Schmidt, K. C. Kim, A. Chakraborty, S. Nakamura, and S. DenBaars, *Electrical Characteristics of Nonpolar InGaN-Based Light-Emitting Diodes Evaluated at Low Temperature,* Japanese Journal of Applied Physics **46,** No 11 7309-7310 (2007)

346. H. Yamada, K. Iso, M. Saito, K. Fujito, S. DenBaars, J. Speck, and S. Nakamura, *Impact of Substrate Miscut on the Characteristic of m-plane InGaN/GaN Light Emitting Diodes,* Japanese Journal of Applied Physics **46,** No 46 L 1117-L1119 (2007)

347. H. Ikeda, T. Okamura, K. Matsukawa, T. Sota, M. Sugawara, T. Hoshi, P. Cantu, R. Sharma, J. Kaeding, S. Keller, U. Mishra, K. Kosaka, K. Asai, S. Sumiya, T. Shibata, M. Tanaka, J. Speck, S. DenBaars, S. Nakamura, T. Koyama, T. Onuma, and S. Chichibu, *Impact of strain on free-exciton resonance energies in wurtzite AlN,* Journal Of Applied Physics **102,** 123707 (2007)

348. H. Masui, S. Nakamura, S. DenBaars, *Analytical light-ray tracing in two-dimensional objects for light-extraction problems in light-emitting diodes,* Applied Optics **47,** No 1 88-92 (2007)

349. D. Feezell, S. DenBaars, J. Speck, S. Nakamura, *Recent Performance of Nonpolar and Semipolar GaN-Based Light Emitting Diodes and Laser Diodes,* Compound Semiconductor Integrated Circuit Symposium IEEE 1-4 (2007)

350. B.Imer, B. Haskell, S. Rajan, S. Keller, U. Mishra, S. Nakamura, J. Speck, S. DenBaars, Electrical characterization of low defect density nonpolar (11$\bar{2}$0) a-plane GaN grown with sidewall lateral epitaxial overgrowth (SLEO), Journal of Materials Research **23,** No 2 551-555 (2007)

351. T. Hashimoto, F. Wu, M. Saito, K. Fujito, J.Speck, S. Nakamura, *Status and Perspectives of the Ammonothermal Growth of GaN Substrates,* Journal of Crystal Growth **310,** 876-880 (2007)

352. Z. Chen, N. Fichtenbaum, D. Brown, S. Keller, U.K. Mishra, S.P. Denbaars, and S. Nakamura, *Influence of Mg Doping on the Morphological, Optical, and Structural Properties of InGaN/GaN Multiple Quantum Wells,* Journal of Electronic Materials **37,** No 5 546-549 (2007)

353. S. Nakamura, J. S. Speck, and S. P. DenBaars et. al, *Characterization of nanoscale electronic structure in nonpolar GaN using scanning capacitance microscopy,* Journal of Applied Physics **103,** 014305 (2008)

354. A. David, B. Moran, K. McGroddy, E. Matioli, E. Hu, S DenBaars, S. Nakamura, and C. Weisbuch, *GaN/InGaN light emitting diodes with embedded photonic crystal obtained by lateral epitaxial overgrowth,* Applied Physics Letters **92,** 113514 (2008)

355. K. Fujito, J. Speck, S. DenBaars, S. Nakamura, et. al, *Comparison of InGaN/GaN light emitting diodes grown on m -plane and a -plane bulk GaN substrates,* Phys Stat Sol RRL **2,** No 2 89-91 (2008)

356. H. Yamada, K. Iso, M. Saito, H. Masui, K. Fujito, S. DenBaars, and S. Nakamura, *Compositional Dependence of Nonpolar m-Plane $In_xGa_{1-x}N$/GaN Light Emitting Diodes,* Applied Physics Express **1,** 041101 (2008)

357. H. Masui, H. Yamada, K. Iso, S. Nakamura, and S. DenBaars, *Optical polarization characteristics of InGaN/GaN light-emitting diodes fabricated on GaN substrates oriented between (1010) and (1011) planes,* Applied Physics Letters **92,** 091105 (2008)

358. H. Sato, H. Hirasawa, H. Asamaizu, N. Fellows, A. Tyagi, M. Saito, K. Fujito, J. Speck, S. DenBaars, S. Nakamura, *High Power and High Efficiency Semipolar InGaN light Emitting Diodes,* Journal of Light and Vis. Env. **32,** No 2 107-110 (2008)

359. A. Murai, D. Thompson, U. Mishra, S. Nakamura, and S. DenBaars, *ZnO cone-shaped blue light emitting diodes,* Proceedings of SPIE Conferences and Symposiums **6895,** 68950N-1-68950N-9 (2008)

360. H. Masui, H. Kroemer, M. Schmidt, K.C. Kim, N. Fellows, S. Nakamura and S. DenBaars, *Electroluminescence efficiency of (1010)-oriented InGaN-based light-emitting diodes at low temperature,* Journal of Physics D: Applied Physics **41,** 082001 (2008)

361. A. Tyagi, H. Zhong, R. Chung, D. Feezell, M. Saito, K. Fujito, J. Speck, S. DenBaars, S. Nakamura, *InGaN/GaN laser diodes on semipolar (10$\bar{1}$1) bulk GaN substrates,* Phys Stat Sol C **5,** No 6 2108-2110 (2008)

362. H. Masui, T. Ive, M. Schmidt, N. Fellows, H. Sato, H. Asamizu, S. Nakamura, and S. DenBaars, *Equivalent-Circuit Analysis for the Electroluminescence-Efficiency Problem of InGaN/GaN Light-Emitting Diodes,* Japanese Journal of Applied Physics **47,** No 4 2112-2118 (2008)

363. N. Fellows, H. Masui, H. Sato, H. Asamizu, M. Iza, H. Zhong, S. Nakamura, S. DenBaars, *Enhancement of external quantum efficiency in GaN-based light emitting diodes using a suspended geometry* Phys Stat Sol C **5,** No 6 2216-2218 (2008)

364. D. Thompson, A. Murai, M. Iza, S. Brinkley, S. DenBaars, U. Mishra, and S. Nakamura, *Hexagonal Truncated Pyramidal Light Emitting Diodes through Wafer Bonding of ZnO to GaN, Laser Lift-off, and Photo Chemical Etching,* Japanese Journal of Applied Physics **47,** No 5 3447-3449 (2008)

365. R. Barabash, G. Ice, B. Haskell, S. Nakamura, J. Speck , W. Liu, *White X-ray microdiffraction analysis of defects, strain and tilts in a free standing GaN film,* Phys Stat Sol B **245,** No 5 899-902 (2008)

366. H. Ikeda, T. Okamura, K. Matsukawa, T. Sota, M. Sugawara, et al., *Erratum: "Impact of strain on free-exciton resonance energies in wurtzite AlN" [J. Appl. Phys. 102, 123707 (2007)],* Journal of Applied Physics **103,** 089901 (2008)

367. H. Masui, H. Yamada, K. Iso, H. Hirasawa, N. Fellows, J. Speck, S. Nakamura, S. DenBaars, *Optical polarization of m -plane In-GaN/GaN light-emitting diodes characterized via confocal microscope,* Phys Stat Sol A **205,** No 5 1203-1206 (2008)

368. H.Masui, H. Yamada, K. Iso, J. Speck, S. Nakmura, S. DenBaars, *Non-polar-oriented InGaN light-emitting diodes for liquid-crystal-display backlighting,* Journal of the Society for Information Display **16**, Issue 4, pp. 571-578 (2008)

369. H. Masui, N. Fellows, S. Nakamura and S. DenBaars, *Optical polarization characteristics of light emission from sidewalls of primary-color light-emitting diodes,* Semiconductor Science and Technology **23,** 072001 1-4 (2008)

370. B. Imer, M. Schmidt, B. Haskell, S. Rajan, B. Zhong, K.C. Kim, F. Wu, T. Mates, S. Keller, U. Mishra, S. Nakamura, J. Speck, S. DenBaars, *Improved quality nonpolar a -plane GaN/AlGaN UV LEDs grown with sidewall lateral epitaxial overgrowth (SLEO),* Phys Stat Sol A **205,** No 7 1705-1712 (2008)

371. H. Masui, S. Nakamura and S. DenBaars, *Experimental technique to correlate optical excitation intensities with electrical excitation intensities for semiconductor optoelectronic device characterization,* Semiocnductor Science and Technology **23,** 085018 (2008)

372. B. Imer, B. Haskell, S. Rajan, S. Keller, U. Mishra, S. Nakamura, J. Speck, S. DenBaars, *Electrical characterization of low defect density nonpolar (11$\bar{2}$0)* a-*plane GaN grown with sidewall lateral epitaxial overgrowth (SLEO)*, Journal of Material Research **23,** No 2 551-555 (2008)

373. H. Sato, R. Chung, H. Hirasawa, N. Fellows, H. Masui, F. Wu, M. Saito, K. Fujito, J. Speck, S. DenBaars, and S. Nakamura, *Optical properties of yellow light-emitting diodes grown on semipolar (1122) bulk GaN substrates,* Applied Physics Letters **92,** 221110 (2008)

374. T. Hashimoto, F. Wu, J. Speck, S. Nakamura, *Ammonothermal Growth of Bulk GaN,* Journal of Crystal Growth **310,** 3907-3910 (2008)

375. H. Masui, J. Sonoda, N. Pfaff, I. Koslow, S. Nakamura and S. DenBaars, *Quantum-confined Stark effect on photoluminescence and electroluminescence characteristics of InGaN-based light-emitting diodes,* Journal of Physics D: Applied Physics **41,** 165105 (2008)

376. K. McGroddy, A. David, E. Matioli, M. Iza, S. Nakamura, S. DenBaars, J. S. Speck, C. Weisbuch, and E. L. Hu, *Directional emission control and increased light extraction in GaN photonic crystal light emitting diodes,* Applied Physics Letters **93,** 103502 (2008)

377. A. Tyagi, Y.D. Lin, D. Cohen, M. Saito, K. Fujito, J. Speck, S. DenBaars, and S. Nakamura, *Stimulated Emission at Blue-Green (480 nm) and Green (514 nm) Wavelengths from Nonpolar (m-plane) and Semipolar (1122) InGaN Multiple Quantum Well Laser Diode Structures,* Applied Physics Express **1,** 091103 (2008)

378. H. Asamizu, M. Saito, K. Fujito, J. Speck, S. DenBaars, and S. Nakamura, *Demonstration of 426 nm InGaN/GaN Laser Diodes Fabricated on Free-Standing Semipolar (1122) Gallium Nitride Substrates,* Applied Physics Express **1,** 091102 (2008)

379. N. Fellows, H. Sato, Y.D. Lin, R. Chung, S. DenBaars, S. Nakamura, *Dichromatic color tuning with InGaN-Based Light-Emitting Diodes,* Applied Physics Letters **93,** 121112 (2008)

380. K.C. Kim, M. Schmidt, F. Wu, M. McLaurin, A. Hirai, S. Nakamura, S. DenBaars, and J. Speck, *Low extended defect density nonpolar* m-*plane GaN by sidewall lateral epitaxial overgrowth,* Applied Physics Letters **93,** 142108 (2008)

381. H. Masui, H. Yamada, K. Iso, S. Nakamura and S. DenBaars, *Optical polarization characteristics of m-oriented InGaN/GaN light-emitting diodes with various indium compositions in single-quantum-well structure,* Journal of Physics D: Applied Physics **41,** 225104 (2008)

382. A. Murai, D. Thompson, H. Hirasawa, N. Fellows, S. Brinkley, C.J. Won, M. Iza, U. Mishra, S. Nakamura, and S. DenBaars, *Pointed Cone Shaped Light-Emitting Diodes Based on ZnO/GaN Wafer Bonding,* Japanese Journal of Applied Physics **47,** No 5 3522-3523 (2008)

383. N. Fellows, H. Sato, H. Masui, S. DenBaars, and S. Nakamura, *Increased Polarization Ratio on Semipolar (1122) InGaN/GaN Light-Emitting Diodes with Increasing Indium Composition,* Japanese Journal of Applied Physics **47,** No 10 7854-7836 (2008)

384. M. Saito, D. Kamber, T. Baker, K. Fujito, S. DenBaars, J. Speck, and S. Nakamura, *Plane Dependent Growth of GaN in Supercritical Basic Ammonia,* Applied Physics Express **1,** 121103 (2008)

385. H. Yamada, K. Iso, H. Masui, M. Saito, K. Fujito, S. DenBaars, S. Nakamura, *Effects of off-axis GaN substrates on optical properties of m-plane InGaN/GaN light-emitting diodes,* Journal of Crystal Growth **310,** 4968-4971 (2008)

386. K. Vampola, N. Fellows, H.Masui, S. Brinkley, M. Furukawa, R. Chung, H. Sato, J. Sonoda, H. Hirasawa, M. Iza, S. DenBaars, S. Nakamura, *Highly efficient broad-area blue and white light-emitting diodes on bulk GaN substrates,* Phys Stat Sol A **206,** No 2 200-202 (2008)

387. Z. Chen, S. Newman, D. Brown, R. Chung, S. Keller, U. Mishra, S. DenBaars, S. Nakamura, *High Quality AIN Grown on SiC by Metal Organic Chemical Vapor Deposition,* Applied Physics Letters **93,** 191906 (2008)

388. H. Masui, M. Schmidt, N. Fellows, H. Yamada, K. Iso, J. Speck, S. Nakamura, S. DenBaars, *Recent progress in nonpolar LEDs as polarized light emitters,* Phys Stat Sol A **206,** No 2 203-205 (2008)

389. E. Letts, J. Speck, S. Nakamura, *Effect of Indium on the Physical Vapor Transport Growth of AIN,* Journal of Crystal Growth **311,** 1060-1064 (2009)

390. S. Nakamura, M. Riordan, *The Dawn of Miniature Green Lasers,* Scientific American **300,** No 4 (2009)

391. S. Nakamura, *Current Status of GaN-Based Solid-State Lightin*g, MRS Bulletin **34,** 101-107 (2009)

392. M. Saito, H. Yamada, K. Iso, H. Sato, H. Hirasawa, D. Kamber, T., S. DenBaars, J. Speck, and S. Nakamura, *Evaluation of GaN substrates grown in supercritical basic ammonia,* Applied Physics Letters **94,** 052109 (2009)

393. K. Vampola, M. Iza, S. Keller, S. DenBaars, S. Nakamura, *Measurement of electron overflow in 450 nm InGaN light-emitting diode structures,* Applied Physics Letters **94,** 061116 (2009)

394. H. Asamizu, M. Saito, K. Fujito, J. Speck, S. DenBaars, S. Nakamura, *Continuous-Wave Operation of InGaN/GaN Laser Diodes on Semipolar (1122) Plane Gallium Nitrides,* Applied Physics Express **2,** 021002 (2009)

395. G. Garrett, H. Shen, M. Wraback, A. Tyagi, M. Schmidt, J. Speck, S. DenBaars, S. Nakamaura, *Comparison of time-resolved photoluminescence from InGaN single quantum wells grown on nonpolar and semipolar bulk GaN substrates,* Phys Stat Sol C **6,** No S2 S800-S803 (2009)

396. A. Uedono, S. Ishibashi, S. Keller, C. Moe P. Cantu, T. M. Katona, D. S. Kamber, Y. Wu, E. Letts, S. Newman, S. Nakamura, J. Speck, U. Mishra, S. DenBaars, T. Onuma, S. Chichibu, *Vacancy-oxygen complexes and their optical properties in AlN epitaxial films studied by positron annihilation* Journal of Applied Physics **105,** 054501 (2009)

397. H. Zhong, A. Tyagi, N. Pfaff, M. Saito, K. Fujito, J. Speck, S. DenBaars, and S. Nakamura, *Enhancing the Light Extraction Efficiency of Blue Semipolar (10$\bar{1}$ $\bar{1}$) Nitride-Based Light Emitting Diodes through Surface Patterning,* Japanese Journal of Applied Physics **48,** 030201 (2009)

398. Z. Chen, Y. Pei, S. Newman, R. Chu, D. Brown, R. Chung, S. Keller, S. Denbaars, S. Nakamura, U. Mishra, *Growth of AlGaN/GaN heterojunction field effect transistors on semi-insulating GaN using an AlGaN interlayer,* Applied Physics Letters **94,** 113108 (2009)

399. S. Newman, D. Kamber, T. Baker, Y. Wu, F. Wu, Z. Chen, S. Nakamura, J. Speck, S. DenBaars, *Lateral epitaxial overgrowth of (0001) AlN on patterned sapphire using hydride vapor phase epitaxy,* Applied Physics Letters **94,** 121906 (2009)

400. S. Pimputkar, J. Speck, S. DenBaars, S. Nakamura, *Prospects for LED Lighting,* Nature Photonics **Vol.3** 180-182 (2009)

401. H. Masui, S. Cruz, S. Nakamura, S. DenBaars, *Geometrical Characteristics and Surface Polarity of Inclined Crystallographic Planes of the Wurtzite and Zincblende Structures,* Journal of Electronic Materials **38,** No 6 756-760 (2009)

402. A. Tamboli, A. Hirai, S. Nakamura, S. DenBaars, E. Hu, *Photoelectrochemical etching of p-type GaN heterostructures,* Applied Physics Letters **94,** 15113 (2009)

403. Z. Chen, Y. Pei, S. Newman, D. Brown, R. Chung, S. Keller, S. P. Denbaars, S. Nakamura, U. Mishra, *Growth of AlGaN/GaN/AlGaN double heterojunction field-effect transistors and the observation of a compositional pulling effect,* Applied Physics Letters **94,** 171117 (2009)

404. D. Feexell, M. Schmidt, S. DenBaars, S. Nakamura, *Development of Nonpolar and Semipolar InGaN/GaN Visible Light-Emitting Diodes,* MRS Bulletin **34,** 318-323 (2009)

405. H. Masui, H. Asamizu, T. Melo, H. Yamada, K. Iso, S. Cruz, S. Nakamura, S. DanBaars, *Effects of piezoelectric fields on optoelectronic properties of InGaN/GaN quantum-well light-emitting diodes prepared on nonpolar (1010) and semipolar (1122) orientations,* Journal of Physics D: Applied Physics **42,** 135106 (2009)

406. H. Shen, M. Wraback, H. Zhong, A. Tyagi, S. P. DenBaars, S. Nakamura, and J. S. Speck, *Determination of polarization field in a semipolar (11$\bar{2}$2) InGa/GaN single quantum well using Franz–Keldysh oscillations in electroreflectance,* Applied Physics Letters **94,** 241906 (2009)

407. K. Kelchner, M. Hardy, R. Ferrell, D. Haeger, F. Wu, K. Fujito, D. Cohen, A. Chakraborty, H. Ohta, J. Speck, S. Nakamura, S. DenBaars, *Nonpolar AlGaN-Cladding-Free Blue Laser Diodes with InGaN Waveguiding,* Applied Physics Express **2,** 071003 (2009)

408. H. Masui, H. Asamizu, A.Tyagi, N. Fellows, S. Nakamura, S. DenBaars, *Correlation between Optical Polarization and Luminescence Morphology of (1122)-Oriented InGaN/GaN Quantum-Well Structures,* Applied Physics Express **2,** 071002 (2009)

409. Y.D.Lin, A. Chakraborty, S. Brinkley, H. C. Kuo, T. Melo, K. Fujito, J. Speck, S. DenBaars, S. Nakamura, *Characterization of blue-green m-plane InGaN light emitting diodes,* Applied Physics Letters **94,** 261108 (2009)

410. H. Masui, S. Keller, N. Fellows, N. Fichtenbaum, M. Furukawa, S. Nakamura, U. Mishra, S. DenBaars, *Luminescence Characteristics of N-Polar GaN and InGaN Films Grown by Metal Organic Chemical Vapor Deposition,* Japanese Journal of Applied Physics **48,** 071003 (2009)

411. H. Shen, M. Wraback, H. Zhong, A. Tyagi, S. P. DenBaars, S. Nakamura, J. S. Speck, *Unambiguous evidence of the existence of polarization field crossover in a semipolar InGaN/GaN single quantum well,* Applied Physics Letters **95,** 033503 (2009)

412. Y.D. Lin, M. Hardy, K. Kelchner, D. Haeger, R. Farrell, K. Fujito, A. Chakraborty, H. Ohta, J. Speck, S. DenBaars, S. Nakamura, *Blue-Green InGaN/GaN Laser Diodes on Miscut m-Plane GaN Substrate,* Applied Physics Express **2,** 082102 (2009)

413. Y-D. Lin, C. Y. Huang, M. Hardy, P. S. Hsu, K. Fujito, A. Chakraborty, H. Ohta, J. Speck, S. DenBaars, S. Nakamura, m-*plane pure blue laser diodes with* p-*GaN/*n-*AlGaN-based asymmetric cladding and InGaN-based wave-guiding layers,* Applied Physics Letters **95,** 081110 (2009)

414. Y. Yamauchi, M. hashisaka, S. Nakamura, K. Chida, S. Kasai, T. Ono, R. Leturcq, K. Ensslin, D. Driscoll, A. Gossard, K. Kobyashi, *Universality of bias- and temperature-induced dephasing in ballistic electronic interferometers,* Physical Review B **79,** 161306(R) (2009)

415. H. Masui, J. Sonoda, A. Chakraborty, H. Yamada, K. Iso, N. Pfaff, I. Koslow, S. Nakamura, S. DenBaars, *Customized Filter Cube in Fluorescence Microscope Measurements of InGaN/GaN Quantum-Well Characterization,* Japanese Journal of Applied Physics **48,** 098003 (2009)

416. H. Masui, T. Melo, J. Sonoda, C. Weisbuch, S. Nakamura, S. DenBaars, *Effects of Growth Temperature and Postgrowth Annealing on Inhomogeneous Luminescence Characteristics of Green-Emitting InGaN Films,* Journal of Electronical Materials **39,** No 1 15-19 (2009)

417. A. Sztein, H. Ohta, J. Sonoda, A Ramu, J. Bowers, S. DenBaars, S. Nakamura, *GaN-Based Integrated Lateral Thermoelectric Device for Micro-Power Generation,* Applied Physics Letters **2,** 111003 (2009)

418. W.B. Im, Y. Fourr´e, S. Brinkley, J. Sonoda, S. Nakamura, S. DenBaars, R. Seshadri, *Substitution of oxygen by fluorine in the GdSr2AlO5:Ce3+ phosphors: Gd1−xSr2+xAlO5−xFx solid solutions for solid state white lighting,* Optics Express **17,** No 25 22673-22679 (2009)

419. H. Masui, D. Kamber, M. Iza, J. Speck, S. Nakamura, S DenBaars, et. al, *Spontaneous formation of {1$\bar{1}$ 01} InGaN quantum wells on a (11$\bar{2}$ 2) GaN template and their electroluminescence characteristics,* Semiconductor Science and Technology **25,** 015003 (2009)

420. M. Hardy, K. Kelchner, K. Fujito, J. Speck, S. Nakamura, S. DenBaars, et. al, *m-Plane GaN-Based Blue Superluminescent Diodes Fabricated Using Selective Chemical Wet Etching,* Applied Physics Express **2,** 121004 (2009)

421. A. Tyagi, F. Wu, E. Young, H. Ohta, S. DenBaars, R. Bhat, K. Fujito, S. DenBaars, S. Nakamura, J. Speck, *Partial strain relaxation via misfit dislocation generation at heterointerfaces in (Al,In)GaN epitaxial layers grown on semipolar (11$\bar{2}$2) GaN free standing substrates,* Applied Physics Letters **95,** 251905 (2009)

422. A. Tyagi, R. Farrell, K. Kelchner, D. Haeger, M. Hardy, C. Holder, K. Fujito, D. Cohen, H. Ohta, J. Speck, S. DenBaars, S. Nakamura, *AlGaN-Cladding Free Green Semipolar GaN Based Laser Diode with a Lasing Wavelength of 506.4 nm,* Applied Physics Express **3,** 011002 (2009)

423. Y. Yamauchi, M. Hashisaka, S. Nakamura, K. Chida, S. Kasai, T. Ono, R. Leturcq, D. Driscoll, A. Gossard, K. Kobayashi, *Non-equilibrium dephasing in ballistic interferometers,* Journal of Physics: Conference Series **193,** 012045 (2009)

424. J. Raring, E. Hall, M. Schmidt, C. Poblenz, B. Li, N. Pfister, D. Kebort, Y. C. Chang, D. Feezell, R. Craig, J. Speck, S. DenBaars, S. Nakamura, *State-of-the-art continuous-wave InGaN laser diodes in the violet, blue, and*

green wavelength regimes, Proceedings of SPIE Conferences and Symposiums **7686,** 76860L-1-76860L-10 (2010)

425. J. Raring, E. Hall, M. Schmidt, C. Poblenz, B. Li, N. Pfister, D. Kebort, Y. C. Chang, D. Feezell, R. Craig, J. Speck, S. DenBaars, S. Nakamura, *High-power high-efficiency continuous-wave InGaN laser diodes in the violet, blue, and green wavelength regimes,* Proceedings of SPIE Conferences and Symposiums **7602,** 760218-1-760818-10 (2010)

426. H. Masui, S. Nakamura, S. DenBaars, U. Mishra, *Nonpolar and Semipolar III-Nitride Light-Emitting Diodes: Achievements and Challenges,* IEEE Transactions on Electron Devices **57,** No 1 88-100 (2010)

427. C.Y. Huang, A. Tyagi, Y.D. Lin, M. Hardy, P.S. Hsu, K. Fujito, J.S. Ha, H. Ohta, J. Speck, S. DenBaars, S. Nakamura, *Propagation of Spontaneous Emission in Birefringent m-Axis Oriented Semipolar (1122) (Al,In,Ga)N Waveguide Structures,* Japanese Journal of Applied Physics **49,** 010207 (2010)

428. E. Young, F. Wu, A. Romanov, A. Tyagi, C. Gallinat, S. DenBaars, S. Nakamura, S. Speck, *Lattice Tilt and Misfit Dislocations in (1122) Semipolar GaN Heteroepitaxy,* Applied Physics Express **3,** 011004 (2010)

429. C. Y. Huang, Y. D. Lin, A Tyagi, A. Chakraborty, H. Ohta, J. Speck, S. DenBaars, S. Nakamura, *Optical waveguide simulations for the optimization of InGaN-based green laser diodes,* Journal of Applied Physics **107,** 023101 (2010)

430. S. Nakamura, Y. Yamauchi, M. Hashisaka, K. Chida, K. Kobyashi, T. Ono, R. Leturcq, K. Ensslin, K. Saito, Y. Utsumi, A. Gossard, *Nonequilibrium Fluctuation relations in a Quantum Coherent Conductor,* The American Physical Society: Physical Review Letters **104,** 080602 (2010)

431. H. Masui, S. Nakamura, S. DenBaars, *Technique to evaluate the diode ideality factor of light-emitting diodes,* Applied Physics Letters **96,** 073509 (2010)

432. T. Onuma, A. Uedono, H. Asamizu, H. Sato, J. Kaeding, M. Iza, S. DenBaars, S. Nakamura, S. Chichibu, *Photoluminescence and positron annihilation studies on Mg-doped nitrogen-polarity semipolar (1011) GaN heteroepitaxial layers grown by metalorganic vapor phase epitaxy,* Applied Physics Letters **96,** 091913 (2010)

433. P.S. Hsu, K. Kelchner, A. Tyagi, R. Ferrell, D. Haeger, K. Fujito, H. Ohta, S. DenBaars, J. Speck, S. Nakamura, *InGaN/GaN Blue Laser Diode Grown on Semipolar (3031) Free-Standing GaN Substrates,* Applied Physics Express **3,** 052702 (2010)

434. R. Farrell, P. S. Hsu, D. Hager, K. Fujito, S. DenBaars, S. Nakamura, J. Speck, *Low-threshold-current-density AlGaN-cladding-free* m-*plane InGaN/GaN laser diodes,* Applied Physics Letters **96,** 231113 (2010)

435. R. Farrell, D. Haeger, X. Chen, C. Gallinat, R. Davis, M. Cornish, K. Fujito, S. Keller, S. DenBaars, S. Nakamura, J. Speck, *Origin of pyramidal hillocks on GaN thin films grown on free-standing m-plane GaN substrates,* Applied Physics Express **96,** 231907 (2010)

436. F. Wu, Y.D. Lin, A. Chakraborty, H. Ohta, S. DenBaars, S. Nakamura, J. Speck, *Stacking fault formation in the long wavelength InGaN/GaN multiple quantum wells grown on m-plane GaN,* Applied Physics Letters **96,** 231912 (2010)

437. V. Liuolia, S. Marcinkevicius, Y. Lin, H. Ohta, S. DenBaars, S. Nakamura, *Dynamics of polarized photoluminescence in m-plane InGaN/GaN quantum wells,* Journal of Applied Physics **108,** 023101 (2010)

438. C. Pan, I. Koslow, J. Sonoda, H. Ohta, J. Ha, S. Nakamura, S. DenBaars, *Vertical Stand Transparent Light-Emitting Diode Architecture for High-Efficiency and High-Power Light-Emitting Diodes,* Japanese Journal of Applied Physics **49,** 080210 (2010)

439. I. Koslow, J. Sonoda, R. Chung, C. Pan, S. Brinkley, H. Ohta, S. Nakamura, S. DenBaars, *High Power and High Efficiency Blue InGaN Light Emitting Diodes on Free-Standing Semipolar (30(3)over-bar(1)over-bar) Bulk GaN Substrate,* Japanese Journal of Applied Physics **49,** 080203 (2010)

440. Y. Lin, S. Yamamoto, C. Huang, C. Hsiung, F. Wu, K. Fujito, H. Ohta, J. Speck, S. DenBaars, S. Nakamura, *High Quality InGaN/AlGaN Multiple Quantum Wells for Semipolar InGaN Green Laser Diodes,* Applied Physics Express **3,** 082001 (2010)

441. V. Liuolia, A. Pinos, S. Marcinkevičius, Y. D. Lin, H. Ohta, S. P. DenBaars, and S. Nakamura, *Carrier localization in* m-*plane InGaN/GaN quantum wells probed by scanning near field optical spectroscopy,* Applied Physics Letters **97**, 151106 (2010)

442. H. Ohta, S. DenBaars, Shuji Nakamura, *Future of group-III nitride semiconductor green laser diodes [Invited],* Journal of Optical Society of America-B, Optical Physics **27**, Issue 11 ***(2010)***

443. R. Farrell, D. Haeger, X. Chen, M. Iza, A. Hirai, K. Kelchner, K. Fujito, A. Chakraborty, S. Keller, S. DenBaars, J. Speck, S. Nakamura, *Effect of carrier gas and substrate misorientation on the structural and optical properties of m-plane InGaN/GaN light-emitting diodes,* Journal of Crystal Growth **313,** 1-7 (2010)

444. B. Bryant, D. Kamber, F. Wu, S. Nakamura, J. S. Speck, *Aluminum nitride grown on lens shaped patterned sapphire by hydride vapor phase epitaxy*, Physica Status Solidi C **8**, Issue 5, 1463-1466 (2011)

445. P. S. Hsu, J. Sonoda, K. Kelchner, A. Tyagi, R. Farrell, D. Haeger, E. Young, A. Romanov, K. Fujito, H. Ohta, S. P. DenBaars, J. Speck, S. Nakamura, *Blue InGaN/GaN laser diodes grown on (3031) free-standing GaN substrates*, Physica Status Solidi C **8**, Issue 7-8, 2390-2392 (2011)

446. M. T. Hardy, R. M. Farrell, P. S. Hsu, D. A. Haeger, K. Kelchner, K. Fujito, A. Chakraborty, D. A. Cohen, S. Nakamura, J. S. Speck, S. P. DenBaars, *Effect of n-AlGaN cleave assistance layers on the morphology of c-plane cleaved facets for m-plane InGaN/GaN laser diodes*, Physica Status Solidi C **8**, Issue 7-8, 2226-2228 (2011)

447. S. Brinkley, Y. Lin, A. Chakraborty, N. Pfaff, D. Cohen, J. Speck, S. Nakamura, and S. DenBaars, *Polarized spontaneous emission from blue-green* m-*plane GaN-based light emitting diodes,* Applied Physics Letters **98,** Issue 1, 011110 (2011)

448. E. Matioli, C. Neufeld, M. Iza, S. Cruz, A. Al-Heji, X. Chen, R. Farrell, S. Keller, S. DenBaars, U. Mishra, S. Nakamura, J. Speck, and C. Weisbuch, *High internal and external quantum efficiency InGaN/GaN solar cells,* Applied Physics Letters **98**, Issue 2, 021102 (2011)

449. F. Wu, A. Tyagi, E. Young, A. Romanov, K. Fujito, S. DenBaars, S. Nakamura, and J. Speck, *Misfit dislocation formation at heterointerfaces in (Al,In)GaN heteroepitaxial layers grown on semipolar free-standing GaN substrates,* Journal of Applied Phyics **109,** Issue 3, 033505 (2011)

450. C. Hsiung, Y. Lin, H. Ohta, S. DenBaars, S. Nakamura, *Ohmic Cathode Electrode on the Backside of m-Plane and (20(2)over-bar1) Bulk GaN Substrates for Optical Device Applications,* Japanese Journal of Applied Physics **50**, Issue 3, 030208 (2011)

451. S. Tanaka, Y. Zhao, I. Koslow, C. Pan, H-T. Chen, J. Sonoda, S. DenBaars, S. Nakamura**,** *Droop improvement in high current range on PSS-LEDs,* Electronics Letters **47**, Issue 5 pg. 335-U66 (2011)

452. S. Nakamura, Y. Yamauchi, M. Hashisaka, K. Chida, K. Kobayashi, T. Ono, R. Leturcq, K. Ensslin, K. Saito, Y. Utsumi, A. Gossard, *Fluctuation theorem and microreversibility in a quantum coherent conductor*, Physical Review B **83**, 155431 (2011)

453. S. Bae, D. Lee, B. Kong, H. Cho, J. Kaeding, S. Nakamura, S. DenBaars, J. Speck, *Electroluminescence enhancement of (11(2)over-bar2) semipolar GaN light-emitting diodes grown on miscut m-plane sapphire substrates,* Current Applied Physics **98**, 954-958 (2011)

454. T. Prosa, P. Clifton, H. Zhong, A. Tyagi, R. Shivaraman, S. DenBaars, S. Nakamura, and J. Speck, *Atom probe analysis of interfacial abruptness and clustering within a single In(x)Ga(1-x)N quantum well device on semipolar, (10(11)(--)) GaN substrate,* Applied Physics Letters **98**, Issue 19 191903 (2011)

455. A. Romanov, E. Young, F. Wu, A. Tyagi, C. Gallinat, S. Nakamura, S. DenBaars, J. Speck, *Basal plane misfit dislocations and stress relaxation in III-nitride semipolar heteroepitaxy,* Journal of Applied Physics **109,** Issue 10, 103522 (2011)

456. R. Farrell, C. Neufeld, S. Cruz, J. Lang, M. Iza, S. Keller, S. Nakamura, S. DenBaars, U. Mishra, and J. Speck, *High quantum efficiency InGaN/GaN multiple quantum well solar cells with spectral response extending out to 520 nm,* Applied Physics Letters **98**, Issue 20, 201107 (2011)

457. R. Chung**,** F. Wu**,** Ravi Shivaraman**,** S. Keller**,** S. DenBaars**,** J. Speck**,** and S. Nakamura, *Growth study and impurity characterization of* $Al_xIn_{1-x}N$ *grown by metal organic chemical vapor deposition,* Journal of Crystal Growth **324**, Issue 1 Pg 163-167 (2011)

458. T. J. Prosa, P. H. Clinton, H. Zhong, A. Tyagi, R. Shivaraman, S. P. DenBaars, S. Nakamura, J. S. Speck, *Erratum: Atom probe analysis of interfacial abruptness and clustering within a single In x Ga 1 x N quantum well device on semipolar (10 1¯1¯) GaN substrate*, Applied Physics Letters **98**, 239901 (2011)

459. C. Neufeld, S. Cruz, R. Farrell, Michael Iza, J. Lang, S. Keller, S. Nakamura, S. DenBaars, J. Speck, U. Mishra, *Effect of doping and polarization on carrier collection in InGaN quantum well solar cells,* Applied Physics Letters **98**, Issue 24, 243507 (2011)

460. E. Matioli, S. Brinkley, K. Kelchner, S. Nakamura, S. DenBaars, J. Speck, C. Weisbuch, *Polarized light extraction in m-plane GaN light-emitting diodes by embedded photonic-crystals,* Applied Physics Letters **98,** Issue 25, 251112 (2011)

461. Y. Zhao, S. Tanaka, CC Pan, K. Fujito, D. Feezell, JS Speck, SP DenBaars, S. Nakamura, *High-Power Blue-Violet Semipolar (20(2)over-bar(1)over-bar) InGaN/GaN Light-Emitting Diodes with Low Efficiency Droop at 200 A/cm(2)*, Applied Physics Express, **4**, Issue 8, 082104 (2011)

462. Y. Zhao, S. Tanaka, Q. Yan, C. Huang, R. Chung, C. Pan, K. Fujito, D. Feezell, C. Van de Walle, J. Speck, S. DenBaars, S. Nakamura, *High Optical polarization ratio from semipolar (20(2)over-bar(1)over-bar) blue-green InGaN/GaN light-emitting diodes*, Applied Physics Letters **99**, Issue 5, 051109 (2011)

463. CJ. Neufeld, SC. Cruz, RM Farrell, M. Iza, S. Keller, S. Nakamura, SP DenBaars, JS Speck, UK Mishra, *Observation of positive thermal power coefficient in InGaN/GaN quantum well solar cells*, Applied Physics Letters, **99**, Issue 7, 071104 (2011)

464. PS Hsu, EC Young, AE Romanov, K. Fujito, SP DenBaars, S. Nakamura, JS Speck, *Misfit dislocation formation via pre-existing threading dislocation glide in (11(2)over-bar2) semipolar heteroepitaxy,* Applied Physics Letters, **99**, Issue 8, 081912 (2011)

465. MT Hardy, DF Feezell, SP DenBaars, S. Nakamura, *Group III-nitride lasers: a materials perspective*, Materials Today, **14**, Issue 9, 408-415 (2011)

466. RM Farrell, DA Haeger, PS Hsu, MT Hardy, K. Kelchner, K. Fujito, D. Feezell, U. Mishra, S. DenBaars, J. Speck, S. Nakamura, *AlGaN-Cladding-Free m-Plane InGaN/GaN Laser Diodes with p- Type AlGaN Etch Stop Layers*, Applied Physics Express, **4**, Issue 9, 092105 (2011)

467. R. Chung, O. Bierwagen, F. Wu, S. Keller, S. DenBaars, J. Speck, S. Nakamura, *Temperature Dependent Capacitance-Voltage Analysis of Uninentionally Doped and Si Doped AI0.82ln0.18N Grown on GaN,* Japanese Journal of Applied Physics, **50**, Issue 10, 101001 (2011)

468. C. Huang, Q. Yan, Y. Zhao, K. Fujito, D. Feezell, C. Van de Walle, J. Speck, S. DenBaars, S. Nakamura, *Influence of Mg-doped barriers on semipolar (20(2)over-bar1) multiple-quantum-well green light-emitting diodes*, Applied Physics Letters, **99**, Issue 14, 141114 (2011)

469. R. Farrell, D. Haeger, P. Hsu, K. Fujito, D. Feezell, S. DenBaars, J. Speck, S. Nakamura, *Determination of internal parameters for AlGaN-cladding-free m-plane InGaN/GaN laser diodes,* Applied Physics Letters, **99**, Issue 17, 171115 (2011)

470. R. Farrell, D. Haeger, P. Hsu, M. Schmidt, K. Fujito, D. Feezell, S. DenBaars, J. Speck, S. Nakamura, *High-power blue-violet AlGaN-cladding-free m-plane InGaN/GaN laser diodes,* Applied Physics Letter, **99**, Issue 17, 171113 (2011)

471. Y. Zhao, S. Tanaka, Q. Yan, C. Huang, R. Chung, C. Pan, K. Fujito, D. Feezell, C. Van de Walle, J. Speck, S. DenBaars, and S. Nakamura, *High optical polarization ratio from semipolar (2021) blue-green InGaN/GaN light-emitting diodes,* Applied Physics Letters, **99**, Issue 22, 229902 (2011)

472. C. Huang, M. Hardy, K. Fujito, D. Feezell, J. Speck, S. DenBaars, and S. Nakamura, *Demonstration of 505 nm laser diodes using wavelength-stable semipolar (20(21)over-bar) InGaN/GaN quantum wells,* Applied Physics Letters, **99**, Issue 24, 241115 (2011)

473. S. Brinkley, N. Pfaff, K. Denault, Z. Zhang, H. Hintzen, R. Seshadri, S. Nakamura, and S. DenBaars, *Robust thermal performance of Sr2Si5N8:Eu2+: An efficient red emitting phosphor for light emitting diode based white lighting*, Applied Physics Letters, **99**, Issue 24, 241106 (2011)

474. A. Sztein, H. Ohta, J. Bowers, S. DenBaars, and S. Nakamura, *High temperature thermoelectric properties of optimized InGaN*, Journal of Applied Physics, **110**, Issue 12, 123709 (2011)

475. F. Wu, E. Young, I. Koslow, M. Hardy, P. Hsu, A. Romanov, S. Nakamura, S. DenBaars, and J. Speck, *Observation of non-basal slip in semipolar InxGa1-xN/GaN heterostructures*, Applied Physics Letters, **99**, Issue 25, 251909 (2011)

476. SP DenBaars, CC Pan, N. Pfaff, S. Tanaka, JS Speck, S Nakamura, *Advances in GaN Semiconductors for Energy Efficient Solid State Lighting*, 2012 IEEE Photonics Conference, 427-428 (2012)

477. YJ Zhao, CY Huang, S. Tanaka, CC Pan, K Fujito, D Feezell, JS Speck, SP DenBaars, S. Nakamura, *Semipolar (20(2)over-bar(1)over-bar) Blue and Green InGaN Light-Emitting Diodes*, Conference on Lasers and Electro-Optics (2012)

478. CC Pan, S. Nakamura, SP DenBaars, *High light extraction efficiency light-emitting diodes grown on bulk GaN and sapphire substrates using vertical transparent package*, Conference on Lasers and Electro-Optics (2012)

479. CY Huang, Y. Zhao, MT Hardy, K. Fujito, DF Feezell, JS Speck, SP DenBaars, S. Nakamura, *Semipolar (20(21)over-bar) Laser Diodes (lambda=505nm) with Wavelength-Stable InGaN/GaN Quantum Wells*, Conference on Lasers and Electro-Optics (2012)

480. MT Hardy, PS Hsu, I Koslow, DF Feezell, S. Nakamura, JS Speck, SP DenBaars, *Demonstration of a Relaxed Waveguide Semipolar (20(2)over-bar1) InGaN/GaN Laser Diode*, Conference on Lasers and Electro-Optics (2012)

481. DA Haeger, EC Young, RB Chung, F Wu, AE Romanov, S Nakamura, SP DenBaars, JS Speck, DA Cohen, *384 nm AlGaN Diode Lasers on Relaxed Semipolar Buffers*, Conference on Lasers and Electro-Optics (2012)

482. S. Nakamura, *Latest Performance of GaN-based Nonpolar.Semipolar Emitting Devices*, IEEE International Semiconductor Laser Conference (2012)

483. A. Reading, J. Richardson, C. Pan, S. Nakamura, and S. DenBaars, *High efficiency white LEDs with single-crystal ZnO current spreading layers deposited by aqueous solution epitaxy*, Optics Express, **20**, Issue 1, A13-A19 (2012)

484. P. Hsu, M. Hardy, F. Wu, I. Koslow, E. Young, A. Romanov, K. Fujito, D. Feezell, S. DenBaars, J. Speck, and S. Nakamura, *444.9 nm semipolar (11(2)over-bar2) laser diode grown on an intentionally stress relaxed InGaN waveguiding layer*, Applied Physics Letters, **100**, Issue 2, 021104 (2012)

485. T. Henry, A. Armstrong, K. Kelchner, S. Nakamura, S. DenBaars, J. Speck, *Assessment of deep level defects in m-plane GaN grown by metalorganic chemical vapor deposition*, Applied Physics Letters, **100**, Issue 8 082103 (2012)

486. R. Chung, H. Chen, C. Pan, J. Ha, S. DenBaars, and S. Nakamura, *The polarization field dependence of Ti/Al based Ohmic contacts on N-type semipolar GaN*, Applied Physics Letters, **100**, Issue 9 091104 (2012)

487. S. Brinkley, C. Keraly, J. Sonoda, C. Weisbuch, J. Speck, S. Nakamura, S. DenBaars, *Chip Shaping for Light Extraction Enhancement of Bulk c-Plane Light-Emitting Diodes*, Applied Physics Express, **5**, Issue 3 032104 (2012)

488. Y. Hu, R. Farrell, C. Neufeld, M. Iza, S. Cruz, N. Pfaff, D. Simeonov, S. Keller, S. Nakamura, S. DenBaars, U. Mishra, J. Speck, *Effect of quantum well cap layer thickness on the microstructure and performance of InGaN/GaN solar cells*, Applied Physics Letters, **100**, Issue 16 161101 (2012)

489. D. Haeger, E. Young, R. Chung, F. Wu, N. Pfaff, M. Tsai, K. Fujito, S. DenBaars, J. Speck, S. Nakamura, D. Cohen, *384 nm laser diode grown on a (20(2)over-bar1) semipolar relaxed AlGaN buffer layer*, Applied Physics Letters, **100**, Issue 16 161107 (2012)

490. J. Jewell, D. Simeonov, S. Huang, Y. Hu, S. Nakamura, J. Speck, C. Weisbuch, *Double embedded photonic crystals for extraction of guided light in light-emitting diodes*, Applied Physics Letters, **100**, Issue 17 171105 (2012)

491. P. Hsu, M. Hardy, E. Young, A. Romanov, S. DenBaars, S. Nakamura, J. Speck, *Stress relaxation and critical thickness for misfit dislocation formation in (10(1)over-bar0) and (30(31)over-bar) InGaN/GaN heteroepitaxy*, Applied Physics Letters, **100**, Issue 17 171917 (2012)

492. S. Choi, S. Bae, D. Lee, B. Kong, H. Cho, J. Song, B. Ahn, J. Keading, S. Nakamura, S. DenBaars, J. Speck, *Optical Characterization of Double Peak Behavior in {10(1)over-bar1} Semipolar Light-Emitting Diodes on Miscut m-Plane Sapphire Substrates*, Japanese Journal of Applied Physics, **51**, Issue 5 052101 (2012)

493. Y. Zhao, Q. Yan, C. Huang, S. Huang, P. Hsu, S. Tanaka, C. Pan, Y. Kawaguchi, K. Fujito, C. Van de Walle, J. Speck, S. DenBaars, S. Nakamura, D. Feezell, *Indium incorporation and emission properties of nonpolar and semipolar InGaN quantum wells*, Applied Physics Letters, **100**, Issue 20 201108 (2012)

494. M. Hardy, P. Hsu, F. Wu, I. Koslow, E. Young, S. Nakamura, A. Romanov, S. DenBaars, J. Speck, *Trace analysis of non-basal plane misfit stress relaxation in (20(2)over-bar1) and (30(3)over-bar(1)over-bar) semipolar InGaN/GaN heterostructures*, Applied Physics Letters, **100**, Issue 20 202103 (2012)

495. C. Pan, S. Tanaka, F. Wu, Y. Zhao, J. Speck, S. Nakamura, S. DenBaars, D. Feezell, *High-Power, Low-Efficiency-Droop Semipolar (20(2)over-bar(1)over-bar) Single-Quantum-Well Blue Light-Emitting Diodes*, Applied Physics Express, **5**, Issue 6 062103 (2012)

496. Y. Kawaguchi, C. Huang, Y. Wu, Q. Yan, C. Pan, Y. Zhao, S. Tanaka, K. Fujito, D. Feezell, C. Van de Walle, S. DenBaars, S. Nakamura, *Influence of polarity on carrier transport in semipolar (20(21)over-bar) and (20(2)over-bar1) multiple-quantum-well light-emitting diodes*, Applied Physics Letters, **100**, Issue 23 231110 (2012)

497. E. Matioli, S. Brinkley, K. Kelchner, YL Hu, S. Nakamura, S. DenBaars, J. Speck, C. Weisbuch, *High-brightness polarized light-emitting diodes*, Light: Science & Applications **1,** E22 (2012)

498. C. Holder, J. Speck, S. DenBaars, S. Nakamura, D. Feezell, *Demonstration of Nonpolar GaN-Based Vertical-Cavity Surface-Emitting Lasers*, Applied Physics Express, **5**, Issue 9 092104 (2012)

499. I. Koslow, M. Hardy, P. Hsu, P. Dang, F. Wu, A. Romanov, Y. Wu, E. Young, S. Nakamura, J. Speck, S. DenBaars, *Performance and polarization effects in (11(2)over-bar2) long wavelength light emitting diodes grown on stress relaxed InGaN buffer layers*, Applied Physics Letters, **101**, Issue 12 121106 (2012)

500. M. Hardy, E. Young, P. Hsu, D. Haeger, I. Koslow, S. Nakamura, S. DenBaars, J. Speck, *Suppression of m-plane and c-plane slip through Si and Mg doping in partially relaxed (20(2)over-bar1) InGaN/GaN heterostructures*, Applied Physics Letters, **101**, Issue 13 132102 (2012)

501. R. Chung, C. Han, C. Pan, N. Pfaff, J. Speck, S. DenBaars, S. Nakamura, *The reduction of efficiency droop by Al0.82In0.18N/GaN superlattice electron blocking layer in (0001) oriented GaN-based light emitting diodes*, Applied Physics Letters, **101**, Issue 13 131113 (2012)

502. E. Young, F. Wu, A. Romanov, D. Haeger, S. Nakamura, S. DenBaars, D. Cohen, J. Speck, *Compositionally graded relaxed AlGaN buffers on semipolar GaN for mid-ultraviolet emission*, Applied Physics Letters, **101,** Issue 14 142109 (2012)

503. C. Pan, T. Gilbert, N. Pfaff, S. Tanaka, Y. Zhao, D. Feezell, J. Speck, S. Nakamura, S. DenBaars, *Reduction in Thermal Droop Using Thick Single-Quantum-Well Structure in Semipolar (20(2)over-bar(1)over) Blue Light-Emitting Diodes*, Applied Physics Express, **5**, Issue 10 102103 (2012)

504. A. Sztein, J. Bowers, S. DenBaars, S. Nakamura, *Thermoelectric properties of lattice matched InAlN on semi-insulating GaN templates*, Journal of Applied Physics, **112**, Issue 8 083716 (2012)

505. M. Hardy, S. Nakamura, J. Speck, S. DenBaars, *Suppression of relaxation in (20(2)over-bar1 InGaN/GaN laser diodes using limited area epitaxy*, Applied Physics Letters, **101**, Issue 24 241112 (2012)

506. C. Holder, D. Feezell, J. Speck, S. DenBaars, S. Nakamura, *Demonstration of nonpolar GaN-based vertical-cavity surface-emitting lasers*, Proceedings of SPIE **8639**, 863906 (2013)

507. RM Farell, EC Young, F Wu, S Nakamura, SP DenBaars, J Speck, *Development of High-Performance Nonpolar III-Nitride Light-Emitting Devices*, SIECPC (2013)

508. SP DenBaars, S. Nakamura, J. Speck, *Gallium Nitride Based Light Emitting Diodes (LEDS) for Energy Efficient Lighting and Displays*, SIECPC (2013)

509. S. Nakamura, *GaN-based VCSEL fabricated on Nonpolar GaN substrates*, Conference on Lasers and Electro-Optics Pacific Rim (2013)

510. Y. Zhao, Q. Yan, D. Feezell, K. Fujito, C. Van de Walle, J. Speck, S. DenBaars, S. Nakamura, *Optical polarization characteristics of semipolar (30(3)over-bar1) and (30(3)over-bar(1)over-bar)*, Optics Express, **21**, Issue 1 A53-A59 (2013)

511. S. DenBaars, D. Feezell, K. Kelchner, S. Pimputkar, C. Pan, S. Tanaka, Y. Zhao, N. Pfaff, R. Farrell, M. Iza, S. Keller, U. Mishra, J. Speck, S. Nakamura, *Development of gallium-nitride-based light-emitting diodes (LEDS) and laser diodes for energy-efficient lighting and displays*, Acta Materialia, **61**, Issue 3 945-951 (2013)

512. R. Farrell, D. Haeger, K. Fujito, S. DenBaars, S. Nakamura, J. Speck, *Morphological evolution of InGaN/GaN light-emitting diodes grown on free-standing m-plane GaN substrates*, Journal of Applied Physics, **113,** Issue 6 063504 (2013)

513. Y. Zhao, F. Wu, C. Huang, Y. Kawaguchi, S. Tanaka, K. Fujito, J. Speck, S. DenBaars, S. Nakamura, *Suppressing void defects in long wavelength semipolar (20(21)over-bar) InGaN quantum wells by growth rate optimization*, Applied Physics Letters, **102**, Issue 9 091905 (2013)

514. S. Marcinkevicius, K. Kelchner, S. Nakamura, S. DenBaars, J. Speck, *Optical properties of extended and localized states in m-plane InGaN quantum wells*, Applied Physics Letters, **102**, Issue 10 101102 (2013)

515. S. Pimputkar, S. Kawabata, J. Speck, S. Nakamura, *Surface morphology study of basic ammonothermal GaN grown on non-polar GaN seed crystals of varying surface orientations from m-plane to a-plane*, Journal of Crystal Growth, **368**, 67-71 (2013)

516. D. Feezell, J. Speck, S. DenBaars, S. Nakamura, *Semipolar (20(2)over-bar(1)over-bar) InGaN/GaN Light-Emitting Diodes for High-Efficiency Solid-State Lighting*, Journal of Display Tehcnology, **9**, 190-198 (2013)

517. B. Bryant, A. Hirai, E. Young, S. Nakamura and J. Speck, *Quasi-equilibrium crystal shapes and kinetic Wulff plots for gallium nitride grown by hydride vapor phase epitaxy*, Journal of Crystal Growth, **369**, 14-20 (2013)

518. Y. Kawaguchi, S. Huang, R. Farrell, Y Zhao, J. Speck, S. DenBaars, S. Nakamura, *Dependence of Electron Overflow on Emission Wavelength and Crystallographic Orientation in Single-Quantum-Well III-Nitride Light-Emitting Diodes,* Applied Physics Express, **6**, Issue 5 052103 (2013)

519. A. Sztein, J. Haberstroh, J. Bowers, S. DenBaars and S. Nakamura, *Calculated thermoelectric properties of InxGa1-1xN, InxAl1-xN, and AlxGa1-xN*, Journal of Applied Physics, **113**, Issue 18, 183707 (2013)

520. Y. Zhao, S. Oh, F. Wu, Y. Kawaguchi, S. Tanaka, K. Fujito, J. Speck, S. DenBaars and S. Nakamura, *Green Semipolar (20(2)over-bar(1)over-bar) InGaN Light-Emitting Diodes with Small Wavelength Shift and Narrow Spectral Linewidth*, Applied Physics Express, **6**, Issue 6 062102 (2013)

521. R. Shivaraman, Y. Kawaguchi, S. Tanaka, S. DenBaars, S. Nakamura and J. Speck, *Comparative Analysis of 20(2)over-bar1 and 20(2)over-bar(1)over-bar semipolar GaN light emitting diodes using atom probe tomography*, Applied Physics Letters, **102**, Issue 25 251104 (2013)

522. K. Denault, M. Cantore, S. Nakamura, S. DenBaars and R. Seshadri, *Efficient and stable laser-driven white lighting*, AIP Advances, **3**, Issue 7 072107 (2013)

523. A. Pesach, E. Gross, C. Huang, Y. Lin, A. Vardi, S. Schacham, S. Nakamura and G. Bahir, *Non-polar m-plane intersubband based InGaN/(Al)GaN quantum well infrared photodetectors*, Applied Physics Letters, **103**, Issue 2 022110 (2013)

524. S. Keller, R. Farrell, M. Iza, Y. Terao, N. Young, U. Mishra, S. Nakamura, S. DenBaars and J. Speck, *Influence of the Structure Parameters on the Relaxation of Semipolar InGaN/GaN Multi Quantum Wells*, Japanese Journal of Applied Physics, **52**, Issue 8 UNSP 08JC10 (2013)

525. Y. Kawaguchi, CY Huang, YR Wu, YJ Zhao, S. DenBaars and S. Nakamura, *Semipolar (20(2)over-bar1) Single-Quantum-Well Red Light-Emitting Diodes with a Low Forward Voltage*, Japanese Journal of Applied Physics, **52**, Issue 8 UNSP 08JC08 (2013)

526. MT Hardy, CO Holder, DF Feezell, S. Nakamura, JS Speck, DA Cohen and SP DenBaars, *Indium-tin-oxide clad blue and true green semipolar InGaN/GaN laser diodes*, Applied Physics Letters, **103**, Issue 8 081103 (2013)

527. N. Pfaff, KM Kelchner, DF Feezell, S Nakamura, SP DenBaars and JS Speck, *Thermal Performance of Violet and Blue Single-Quantum-Well Nonpolar m-Plane InGaN Light-Emitting Diodes,* Applied Physics Express, **6**, 092104 (2013)

528. S. Marcinkevicius, KM Kelchner, LY Kuritzky, S. Nakamura, SP DenBaars and JS Speck, *Photoexcited carrier recombination in wide m-plane InGaN/GaN quantum wells*, Applied Physics Letters, **103** 111107 (2013)

529. S. Marcinkevicius, Y. Zhao, KM Kelchner, S. Nakamura, SP DenBaars and JS Speck, *Near-field investigation of spatial variations of (20(2)over-bar(1)over-bar) InGaN quantum well emission spectra*, Applied Physics Letters, **103**, 131116 (2013)

530. S. Nakamura and MR Krames, *History of Gallium-Nitride-Based Light-Emitting Diodes for Illumination*, Proceedings of the IEEE, **101**, 2211-2220 (2013)

531. A. Pourhashemi, RM Farrell, MT Hardy, PS Hsu, KM Kelchner, JS Speck, SP DenBaars and S. Nakamura, *Pulsed high-power AlGaN-cladding-free blue laser diodes on semipolar (20(2)over-bar(1) GaN substrates*, Applied Physics Letters, **103** 151112 (2013)

532. PS Hsu, F Wu, EC Young, AE Romanov, K. Fujito, SP DenBaars, JS Speck and S. Nakamura, *Blue and aquamarine stress-relaxed semipolar (11(2)over-bar2) laser diodes*, Applied Physics Letters, **103** 161117 (2013)

533. N. G. Young, R. M. Farrell, Y.L. Hu, T. Terao, M. Iza, S. Keller, S. P. DenBaars, S. Nakamura and J. S. Speck, *High performance thin quantum barrier InGaN/GaN solar cells on sapphire and bulk (0001) GaN substrates*, Applied Physics Letters **103**, 173903 (2013)

534. KM Kelchner, LY Kuritzky, K. Fujito, S. Nakamura, SP DenBaars and JS Speck, *Emission characteristics of single InGaN quantum wells on misoriented nonpolar m-plane bulk GaN substrates,* Journal of Crystal Growth, **382** 80-86 (2013)

535. PS Hsu, RM Farrell, JJ Weaver, K Fujito, SP DenBaars, JS Speck and S. Nakamura, *Comparison of Polished and Dry Etched Semipolar (11(2)over-bar2) III-Nitride Laser Facets*, IEEE Photonics Technology Letters, **25**, 2105-2107 (2013)

536. BN Bryant, EC Young, F. Wu, K. Fujito, S. Nakamura, and JS Speck, *Basal Plane Stacking Fault Suppression by Nitrogen Carrier Gas in m-plane GaN Regrowth by Hydride Vapor Phase Epitaxy,* Applied Physics Express, **6** 115502 (2013)

537. MT Hardy, F. Wu, PS Hsu, DA Haeeger, S. Nakamura, JS Speck, and SP DenBaars, *True green semipolar lnGaN-based laser diodes beyond critical thickness limits using limited area epitaxy,* Journal of Applied Physics, **114** 183101 (2013)

538. NC Das, ML Reed, AV Sampath, H. Shen, M. Wraback, Rm Farrell, M. Iza, SC Cruz, JR Lang, NG Young, Y. Terao, CJ Neufeld, S. Keller, S. Nakamura, SP DenBaars, UK Mishra, and JS Speck, *Optimization of Annealing Process for Improved InGaN Solar Cell Performance,* Journal of Electronic Materials, **42,** 3467-3470 (2013)

539. AM Armstrong, K. Kelchner, S. Nakamura, SP DenBaars, and JS Speck, *Influence of growth temperature and temperature ramps on deep level defect incorporation in m-plane GaN,* Applied Physics Letters*,* **103** 232108 (2013)

540. RM Farrel, AA Al-Heji, CJ Neufeld, X. Chen, M Iza, SC Cruz, S. Keller, S. Nakamura, SP DenBaars, UK Mishra, and JS Speck, *Effect of intentional p-GaN surface roughening on the performance of InGaN/GaN solar cells,* Applied Physics Letters, **103** 241104 (2013)

541. A. Sztein, JE Bowers, SP DenBaars, and S. Nakamura, *Polarization field engineering of GaN/AlN/AlGaN superlattices for enhanced thermoelectric properties,* Applied Physics Letters, **104** 042106 (2014)

542. YJ Zhao, F. Wu, TJ Yang, YR Wu, S. Nakamura, and JS Speck, *Atomic-scale nanofacet structure in semipolar (20(2)over-bar1) and (20(2)over-bar1) lnGaN single quantum wells,* Applied Physics Express, **7** 025503 (2014)

543. IL Koslow, MT Hardy, PS Hsu, F. Wu, AE Romanov, EC Young, S. Nakamura, SP DenBaars, and JS Speck, *Onset of plastic relaxation in semipolar (11(2)over-bar2) lnxGa1-xN/GaN heterostructures,* Journal of Crystal Growth, **388**, 48-53 (2014)

544. I Koslow, C McTaggart, F Wu, S Nakamura, J. Speck, S DenBaars, *Improved performance of (2021) long-wavelength light-emitting diodes grown with wide quantum wells on stress-relaxed $In_xGa_{1-x}N$ buffer layers*, Applied Physics Express **7**, Issue 3 031003 (2014)

545. S. Marcinkevicius, R Ivanov, Y. Zhao, S. Nakamura, Sp DenBaars, and JS Speck, *Highly polarized photoluminescence and its dynamics in semipolar (20(2)over-bar(1)over-bar) InGaN/GaN quantum well,* Applied Physics Letters, **104** 111113 (2014)

546. Y. Ji, W Liu, T. Erdem, R. Chen, ST Tan, Z. Zhang, Z. Ju, X Zhang, H. Sun, X Sun, Y. Zhao, S. DenBaars, S. Nakamura and H. Demir, *Comparative study of field-dependent carrier dynamics and emission kinetics of InGaN.GaN light-emitting diodes grown on (112¯2) semipolar versus (0001) polar planes*, Applied Physics Letters **104** 143506 (2014)

547. F. Wu, Y. Zhao, A. Romanov, S. DenBaars, S. Nakamura and J. Speck, *Stacking faults and interface roughening in semipolar (2021) single InGaN quantum wells for long wavelength emission*, Applied Physics Letters **104** 151901 (2014)

548. N. G. Young, E. E. Perl, R. M. Farrell, M. Iza, J. E. Bowers, S. Nakamura, S. DenBaars and J. Speck, *High-performance broadband optical coatings on InGaN/GaN solar cells for multijunction device integration*, Applied Physics Letters **104** 163902 (2014)

PATENTS:

Patent	Title
US PATENTS	
US5290393	Crystal growth method for gallium nitride-based compound semiconductor
US5334277	Method of vapor-growing semiconductor crystal and apparatus for vapor-growing the same
US5433169	Method of depositing a gallium nitride-based III-V group compound semiconductor crystal layer
US5468678	Method of manufacturing P-type compound semiconductor
US5563422	Gallium nitride-based III-V group compound semiconductor device and method of producing the same
US5578839	Light-emitting gallium nitride-based compound semiconductor device
US5652434	Gallium nitride-based III-V group compound semiconductor
US5734182	Light-emitting gallium nitride-based compound semiconductor device
US5747832	Light-emitting gallium nitride-based compound semiconductor device
US5767581	Gallium nitride-based III-V group compound semiconductor
US5777350	Nitride semiconductor light-emitting device
US5877558	Gallium nitride-based III-V group compound semiconductor
US5880486	Light-emitting gallium nitride-based compound semiconductor device
US5959307	Nitride semiconductor device
US6078063	Light-emitting gallium nitride-based compound semiconductor device
US6093965	Gallium nitride-based III-V group compound semiconductor
US6153010	Method of growing nitride semiconductors, nitride semiconductor substrate and nitride semiconductor device
US6172382	Nitride semiconductor light-emitting and light-receiving devices
US6204512	Gallium nitride-based III-V group compound semiconductor device and method of producing the same
US6215133	Light-emitting gallium nitride-based compound semiconductor device
US6469323	Light-emitting gallium nitride-based compound semiconductor device
US6507041	Gallium nitride-based III-V group compound semiconductor
US6580099	Nitride semiconductor light-emitting devices
US6610995	Gallium nitride-based III-V group compound semiconductor
US6677619	Nitride semiconductor device
US7091514	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
US7122844	Susceptor for MOCVD reactor
US7186302	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
US7122844	Susceptor for MOCVD reactor
US7208393	Growth of planar reduced dislocation density m-plane gallium nitride by hydride vapor phase epitaxy
US7220324	Technique for the growth of planar semi-polar gallium nitride
US7220658	Growth of reduced dislocation density non-polar gallium nitride by hydride vapor phase epitaxy
US7223998	White, single or multi-color light emitting diodes by recycling guided modes
US7332365	Method for fabricating group-III nitride devices and devices fabricated using method
US7335920	LED with current confinement structure and surface roughening
US7338828	Growth of planar non-polar {1 -1 0 0} m-plane gallium nitride with metalorganic chemical vapor deposition (MOCVD)
US7427555	Growth of planar, non-polar gallium nitride by hydride vapor phase epitaxy
US7480322	Electrically-pumped (Ga,In,Al)N vertical-cavity surface-emitting laser
US7504274	Fabrication of nonpolar indium gallium nitride thin films, heterostructures and devices by metalorganic chemical vapor deposition

US7518159	Packaging technique for the fabrication of polarized light emitting diodes
US7550395	Control of photoelectrochemical (PEC) etching by modification of the local electrochemical potential of the semiconductor structure relative to the electrolyte
US7575947	Method for enhancing growth of semipolar (Al,In,Ga,B)N via metalorganic chemical vapor deposition
US7687293	Method for enhancing growth of semipolar (Al,In,Ga,B)N via metalorganic chemical vapor deposition
US7687813	Standing transparent mirror-less (STML) light emitting diode
US7691658	Method for improved growth of semipolar (Al,In,Ga,B)N
US7704331	Technique for the growth of planar semi-polar gallium nitride
US7704763	Technique for the highly efficient gallium nitride based LED via surface roughening
US7709284	Method for deposition of Mg Doped (Al,In,Ga, B)N layers
US7719020	(AL, GA, IN)N and ZnO direct wafer bonding structure for optoelectronic applications and its fabrication method
US7723746	Packaging technique for the fabrication of polarized light emitting diodes
US7755172	Opto-electronic and electronic devices using N-face GaN substrate prepared with ammono thermal growth
US7768024	Improved horizontal emitting, vertical emitting, beam shaped, DFB lasers over patterned substrate with multiple overgrowth
US7781789	Transparent mirror-less (TML) light emitting diode
US7839903	Optimization of laser bar orientation for nonpolar (Ga,Al,In,B)N diode lasers
US7842527	MOCVD growth of high performance M-plane GAN optical devices
US7846757	Technique for the growth and fabrication of semipolar (Ga,Al,In,B)N thin films, heterostructures, and devices
US7847280	Nonpolar III-Nitride light emitting diodes with long wavelength emission
US7847293	Growth of reduced dislocation density non-polar gallium nitride by hybrid vapor phase epitaxy
US7858996	Method for growth of semipolar (Al,In,Ga,B) N optoelectronic devices
US7868341	Optical designs for high-efficacy white-light emitting diodes
US7956360	Growth of planar reduced dislocation density M-plane gallium nitride by hydride vapor phase epitaxy
US7956371	High efficiency light emitting diode (LED)
US7982208	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
US7994527	High light extraction efficiency light emitting diode (LED)
US8022423	Standing transparent mirrorless light emitting diode
US8044383	Thin P-type gallium nitride and aluminum gallium nitride electron-blocking layer free gallium nitride-based light emitting diode
US8044417	Enhancement of optical polarization of nitride light-emitting diodes by increased indium incorporation
US8053264	Photoelectrochemical etching of P-type semiconductor heterostructures
US8080469	Method for increasing the area of non-polar and semi-polar nitride substrates
US8084763	Optoelectronic device based on non-polar and semi-polar aluminum indium nitride and aluminum indium gallium nitride alloys
US8097481	Growth of non-polar M-plane III-nitride film using metalorganic chemical vapor deposition (MOCVD)
US8110482	Miscute semipolar optoelectronic device
US8114698	High light extraction efficiency nitride based light emitting diode by surface roughening
US8124991	Light emitting diodes with high extraction efficiency
US8128756	Technique for the growth of planar semi-polar gallium nitride
US8148244	Lateral growth method for defect reduction of semipolar nitride films
US8148713	Method for fabrication of semipolar-(A1,In,Ga,B)N-based light emitting diodes
US8158947	Planar nonpolar m-plane group III nitride films grown on miscute substrates

US8178373	MOCVD growth of high performance m-plane GaN optical devices
US8183557	(Al, In, Ga, B)N device structures on a patterned substrate
US8188458	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
US8193079	Method for conductivity control of semipolar (Al,In,Ga,B) N
US8203159	Method for growth of semipolar (Al,In,Ga,B) N optoelectronic devices
US8211723	AlxGal-x-N-cladding-free nonpolar GaN-Based laser diodes and LED's
US8227818	Improved horizontal emitting, vertical emitting, beam shaped, DFB lasers fabricated by growth over patterned substrate with multiple overgrowth
US8227819	Thin P-type GaN and AlGaN electron-blocking layer free GaN-based light emitting diodes
US8227820	Semiconductor light-emitting device
US8253221	Gallium nitride bulk crystals and their growth method
US8254423	(Al, Ga, In) N Diode laser fabricated at reduced temperature
US8263424	Opto-electronic and electronic devices using N-face GaN substrate prepared with ammonothermal growth
US8278128	Enhancement of optical polarization of nitride light-emitting diodes by wafer miscute
US8294166	Transparent LEDs
US8299452	Method for fabrication of semipolar-(A1,In,Ga,B)N-based light emitting diodes

EUROPE PATENTS

EP00497350B1	Crystal growth method for gallium nitride-based compound semiconductor
EP00497350B2	Crystal growth method for gallium nitride-based compound semiconductor
EP00599224B1	Light-emitting gallium nitride-based compound semiconductor device
EP00541373B1	Method of manufacturing p-type compound semiconductor
EP00541373B2	Method of manufacturing p-type compound semiconductor
EP00622858B1	Gallium nitride-based III-V group compound semiconductor device and method of producing the same

WO00048254A1	Nitride semiconductor device and its manufacturing method
WO00052796A1	Nitride semiconductor laser element
WO03029516A1	Apparatus for inverted CVD
WO03098667A1	Susceptor for MOCVD reactor
WO04079043A2	Susceptor apparatus for inverted type MOCVD reactor
WO05117152A1	Method for fabricating group iii nitride devices and devices Fabricated using method
WO06080958A1	Led with current confinement structure and surface roughening
WO07018789A1	Blue led with roughened high refractive index surface layer For high light extraction
WO98031055A1	Nitride semiconductor device
WO98047170A1	Method of growing nitride semiconductors, nitride Semiconductor substrate and nitride semiconductor device
WO99005728A1	Nitride semiconductor device

JAPAN PATENTS:

特公平 07-083136	窒化ガリウム系化合物半導体発光素子
特公平 08-008217	窒化ガリウム系化合物半導体の結晶成長方法
特許 2141083	窒化ガリウム系化合物半導体発光素子
特許 2141400	窒化ガリウム系化合物半導体の結晶成長方法

特許 2540791　ｐ型窒化ガリウム系化合物半導体の製造方法。
特許 2556211　半導体結晶層の成長装置とその成長方法
特許 2560963　窒化ガリウム系化合物半導体発光素子
特許 2560964　窒化ガリウム系化合物半導体発光素子
特許 2576819　窒化ガリウム系化合物半導体発光素子
特許 2591521　窒化ガリウム系化合物半導体素子
特許 2628404　半導体結晶膜の成長方法
特許 2632239　半導体結晶膜の成長方法および装置
特許 2687742　半導体結晶膜の表面状態測定方法
特許 2697572　窒化ガリウム系化合物半導体発光素子
特許 2713094　半導体発光素子およびその製造方法
特許 2713095　半導体発光素子およびその製造方法
特許 2728190　半導体レーザ素子
特許 2735057　窒化物半導体発光素子
特許 2748354　窒化ガリウム系化合物半導体チップの製造方法
特許 2748355　窒化ガリウム系化合物半導体チップの製造方法
特許 2748818　窒化ガリウム系化合物半導体発光素子
特許 2751963　窒化インジウムガリウム半導体の成長方法
特許 2751987　窒化インジウムガリウム半導体の成長方法
特許 2770717　窒化ガリウム系化合物半導体発光素子
特許 2770720　窒化ガリウム系化合物半導体発光素子
特許 2778349　窒化ガリウム系化合物半導体の電極
特許 2778405　窒化ガリウム系化合物半導体発光素子
特許 2780618　窒化ガリウム系化合物半導体チップの製造方法
特許 2780691　窒化物半導体発光素子
特許 2783349　ｎ型窒化ガリウム系化合物半導体層の電極及びその形成方法
特許 2785253　窒化ガリウム系化合物半導体のｐ型化方法
特許 2785254　窒化ガリウム系化合物半導体発光素子
特許 2790235　窒化ガリウム系化合物半導体のｐ型化方法
特許 2790237　多色発光素子
特許 2790242　窒化物半導体発光ダイオード
特許 2791448　発光ダイオード
特許 2795294　窒化ガリウムアルミニウム半導体の結晶成長方法。
特許 2800666　窒化ガリウム系化合物半導体レーザ素子
特許 2803741　窒化ガリウム系化合物半導体の電極形成方法
特許 2803742　窒化ガリウム系化合物半導体発光素子及びその電極形成方法
特許 2809045　窒化物半導体発光素子
特許 2812375　窒化ガリウム系化合物半導体の成長方法
特許 2827794　ｐ型窒化ガリウムの成長方法
特許 2828187　窒化ガリウム系化合物半導体発光素子
特許 2836685　ｐ型窒化ガリウム系化合物半導体の製造方法
特許 2836686　窒化ガリウム系化合物半導体発光素子
特許 2836687　窒化ガリウム系化合物半導体発光素子
特許 2859478　発光デバイス用の窒化ガリウム系化合物半導体ウエハーの切断方法
特許 2861991　窒化ガリウム系化合物半導体チップの製造方法
特許 2868081　窒化ガリウム系化合物半導体発光素子
特許 2890390　窒化ガリウム系化合物半導体発光素子

特許 2890392　ＩＩＩ－Ｖ族窒化物半導体発光素子
特許 2890396　窒化物半導体発光素子
特許 2891348　窒化物半導体レーザ素子
特許 2900928　発光ダイオード
特許 2900990　窒化物半導体発光素子
特許 2910023　窒化ガリウム系化合物半導体発光素子
特許 2910811　窒化ガリウム系化合物半導体ウエハーの切断方法
特許 2914014　窒化ガリウム系化合物半導体チップの製造方法
特許 2914065　青色発光素子及びその製造方法
特許 2917742　窒化ガリウム系化合物半導体発光素子とその製造方法
特許 2918139　窒化ガリウム系化合物半導体発光素子
特許 2921746　窒化物半導体レーザ素子
特許 3346735　窒化物半導体発光素子及びその製造方法

特許 2932467　窒化ガリウム系化合物半導体発光素子
特許 2932468　窒化ガリウム系化合物半導体発光素子
特許 2947047　ＬＥＤチップのリードフレームへのダイボンド方法
特許 2953326　窒化ガリウム系化合物半導体レーザ素子の製造方法
特許 2956489　窒化ガリウム系化合物半導体の結晶成長方法
特許 2964822　発光ダイオードの製造方法
特許 2976951　窒化物半導体発光ダイオードを備えた表示装置
特許 2982553　発光デバイスの製造方法
特許 2985908　窒化ガリウム系化合物半導体の結晶成長方法
特許 2998696　発光ダイオード
特許 3009091　青色発光ダイオード
特許 3009095　窒化物半導体発光素子
特許 3019132　窒化ガリウム系化合物半導体受光素子
特許 3036465　発光ダイオードを用いたディスプレイ
特許 3047960　ｎ型窒化物半導体の電極
特許 3077781　窒化インジウムガリウムの成長方法
特許 3087829　窒化物半導体素子の製造方法
特許 3087831　窒化物半導体素子
特許 3091593　窒化物半導体発光デバイス用積層体
特許 3101997　窒化物半導体レーザ素子
特許 3129384　窒化物半導体レーザ素子
特許 3135041　窒化物半導体発光素子
特許 3141824　窒化物半導体発光素子
特許 3152238　発光ダイオード
特許 3154364　ｎ型窒化ガリウム系化合物半導体層の電極及びその形成方法
特許 3180710　窒化ガリウム系化合物半導体発光素子の製造方法
特許 3180871　窒化ガリウム系化合物半導体発光素子およびその電極形成方法
特許 3187284　ｎ型窒化物半導体層の電極
特許 3203282　発光デバイス用窒化インジウムガリウム半導体
特許 3209233　青色発光ダイオードおよびその製造方法
特許 3212008　窒化ガリウム系化合物半導体レーザ素子
特許 3216118　窒化物半導体素子及びその製造方法
特許 3218595　窒化物半導体レーザ素子及びその製造方法

特許 3216596　窒化ガリウム系化合物半導体発光素子
特許 3218963　窒化物半導体レーザ素子及びその製造方法
特許 3220977　窒化物半導体レーザ素子及び窒化物半導体レーザ素子の製造方法。
特許 3223810　窒化ガリウム系化合物半導体発光素子
特許 3223832　窒化物半導体素子及び半導体レーザダイオード
特許 3224020　窒化物半導体発光素子およびその製造方法
特許 3227287　窒化ガリウム系化合物半導体チップの製造方法と窒化ガリウム系化合物半導体素子
特許 3233258　窒化物半導体の電極
特許 3235440　窒化物半導体レーザ素子とその製造方法
特許 3241250　窒化物半導体レーザ素子
特許 3248564　窒化物半導体レーザダイオード
特許 3255224　窒化ガリウム系化合物半導体素子及びその製造方法
特許 3257344　窒化ガリウム系化合物半導体の結晶成長方法
特許 3257498　窒化ガリウム系化合物半導体の結晶成長方法
特許 3259811　窒化物半導体素子の製造方法及び窒化物半導体素子
特許 3267250　窒化物半導体発光素子
特許 3269070　窒化物半導体発光素子
特許 3271645　窒化物半導体発光ダイオード
特許 3271657　ｎ型窒化ガリウム系化合物半導体の電極及びその形成方法
特許 3272588　窒化物半導体レーザ素子
特許 3274907　窒化インジウムガリウム化合物半導体の成長方法
特許 3275810　窒化物半導体発光素子
特許 3278108　窒化物半導体レーザ素の製造方法
特許 3282174　窒化物半導体発光素子
特許 3282175　窒化物半導体素子
特許 3292083　窒化物半導体基板の製造方法及び窒化物半導体素子の製造方法
特許 3298390　窒化物半導体多色発光素子の製造方法
特許 3298454　窒化ガリウム系化合物半導体発光素子の製造方法
特許 3301345　ｐ型窒化ガリウム系化合物半導体層の形成方法
特許 3301601　窒化物半導体発光素子
特許 3303645　窒化物半導体発光素子の製造方法
特許 3307218　窒化物半導体レーザ素子の製造方法
特許 3309953　窒化物半導体レーザダイオード
特許 3314620　窒化物半導体発光素子
特許 3314641　窒化物半導体レーザ素子
特許 3314666　窒化物半導体素子
特許 3314671　窒化物半導体素子
特許 3319585　窒化物半導体レーザ素子の製造方法
特許 3327170　発光ダイオードの製造方法
特許 3327179　窒化物半導体レーザ素子の製造方法
特許 3329753　窒化物半導体レーザ素子
特許 3334624　窒化物半導体レーザ素子
特許 3336599　窒化物半導体レーザ素子
特許 3339049　窒化物半導体レーザ素子
特許 3460581　窒化物半導体の成長方法及び窒化物半導体素子
特許 3272588　窒化物半導体レーザ素子
特許 3274907　窒化インジウムガリウム化合物半導体の成長方法

特許 3275810　窒化物半導体発光素子
特許 3278108　窒化物半導体レーザ素の製造方法
特許 3282174　窒化物半導体発光素子
特許 3282175　窒化物半導体素子
特許 3292083　窒化物半導体基板の製造方法及び窒化物半導体素子の製造方法
特許 3298390　窒化物半導体多色発光素子の製造方法
特許 3298454　窒化ガリウム系化合物半導体発光素子の製造方法
特許 3301345　ｐ型窒化ガリウム系化合物半導体層の形成方法
特許 3301601　窒化物半導体発光素子
特許 3303645　窒化物半導体発光素子の製造方法
特許 3307218　窒化物半導体レーザ素子の製造方法
特許 3309953　窒化物半導体レーザダイオード
特許 3314620　窒化物半導体発光素子
特許 3314641　窒化物半導体レーザ素子
特許 3314666　窒化物半導体素子
特許 3314671　窒化物半導体素子
特許 3319585　窒化物半導体レーザ素子の製造方法
特許 3327170　発光ダイオードの製造方法
特許 3327179　窒化物半導体レーザ素子の製造方法
特許 3329753　窒化物半導体レーザ素子
特許 3334624　窒化物半導体レーザ素子
特許 3336599　窒化物半導体レーザ素子
特許 3339049　窒化物半導体レーザ素子
特許 3344056　窒化ガリウム系化合物半導体発光素子及びその製造方法
特許 3344414　発光ダイオードを用いたディスプレイ
特許 3298390　窒化物半導体多色発光素子の製造方法
特許 3298454　窒化ガリウム系化合物半導体発光素子の製造方法
特許 3301345　ｐ型窒化ガリウム系化合物半導体層の形成方法
特許 3301601　窒化物半導体発光素子
特許 3303645　窒化物半導体発光素子の製造方法
特許 3307218　窒化物半導体レーザ素子の製造方法
特許 3309953　窒化物半導体レーザダイオード
特許 3314620　窒化物半導体発光素子
特許 3314641　窒化物半導体レーザ素子
特許 3314666　窒化物半導体素子
特許 3314671　窒化物半導体素子
特許 3319585　窒化物半導体レーザ素子の製造方法
特許 3327170　発光ダイオードの製造方法
特許 3327179　窒化物半導体レーザ素子の製造方法
特許 3329753　窒化物半導体レーザ素子
特許 3334624　窒化物半導体レーザ素子
特許 3336599　窒化物半導体レーザ素子
特許 3339049　窒化物半導体レーザ素子
特許 3344056　窒化ガリウム系化合物半導体発光素子及びその製造方法
特許 3344414　発光ダイオードを用いたディスプレイ
特許 3360812　窒化物半導体素子
特許 3366188　窒化物半導体素子

特許 3366586　発光ダイオード
特許 3369089　窒化ガリウム系化合物半導体発光素子
特許 3371830　窒化物半導体発光素子
特許 3372226　窒化物半導体レーザ素子
特許 3374737　窒化物半導体素子
特許 3379619　窒化物半導体レーザ素子
特許 3395631　窒化物半導体素子及び窒化物半導体素子の製造方法
特許 3405334　窒化物半導体素子
特許 3424465　窒化物半導体素子及び窒化物半導体の成長方法
特許 3431389　窒化物半導体レーザ素子
特許 3433730　窒化物半導体発光素子
特許 3434162　窒化物半導体素子
特許 3438675　窒化物半導体の成長方法
特許 3441883　窒化物半導体レーザ素子
特許 3448196　窒化物半導体発光素子
特許 3454355　窒化ガリウム系化合物半導体発光素子
特許 3456413　窒化物半導体の成長方法及び窒化物半導体素子
特許 3468082　窒化物半導体素子
特許 3470712　窒化物半導体レーザ素子
特許 3473595　発光デバイス
特許 3476636　窒化物半導体レーザ素子
特許 3478090　窒化物半導体素子
特許 3478287　窒化ガリウム系化合物半導体の結晶成長方法と窒化ガリウム系化合物半導体
特許 3482955　窒化ガリウム系化合物半導体発光素子
特許 3484842　窒化物半導体レーザ素子
特許 3484997　窒化ガリウム系化合物半導体発光素子
特許 3496480　窒化物半導体素子
特許 3496512　窒化物半導体素子
特許 3502527　窒化物半導体レーザ素子
特許 3505167　窒化ガリウム系化合物半導体発光素子の製造方法
特許 3511970　窒化物半導体発光素子
特許 3523700　窒化物半導体レーザ素子
特許 3529286　窒化物半導体レーザ素子の製造方法
特許 3537977　窒化物半導体レーザ素子の製造方法
特許 3537984　窒化物半導体レーザ素子
特許 3538275　窒化物半導体発光素子
特許 3548442　窒化ガリウム系化合物半導体発光素子
特許 3551751　窒化物半導体の成長方法
特許 3557894　窒化物半導体基板および窒化物半導体素子
特許 3562455　窒化物半導体レーザ素子の形成方法
特許 3565202　窒化物半導体レーザ素子
特許 3593952　窒化物半導体レーザ素子
特許 3604205　窒化物半導体の成長方法
特許 3604278　窒化物半導体レーザー素子
特許 3617565　窒化物半導体レーザ素子
特許 3620292　窒化物半導体素子
特許 3622045　窒化物半導体レーザ素子及びその製造方法

特許 3645207　発光ダイオード
特許 3646649　窒化ガリウム系化合物半導体発光素子
特許 3647236　窒化物半導体レーザ素子
特許 3651260　窒化物半導体素子
特許 3656454　窒化物半導体レーザ素子
特許 3657795　発光素子
特許 3658112　窒化物半導体レーザダイオード
特許 3658892　ｐ型窒化物半導体の成長方法及び窒化物半導体素子
特許 3659050　窒化物半導体の成長方法及び窒化物半導体素子
特許 3660446　窒化物半導体素子及びその製造方法
特許 3669848　窒化物半導体レーザ素子
特許 3679626　窒化ガリウム系化合物半導体チップ
特許 3685682　窒化物半導体レーザ素子
特許 3705047　窒化物半導体発光素子
特許 3724490　発光ダイオード
特許 3724498　発光ダイオード
特許 3744211　窒化物半導体素子
特許 3758562　窒化物半導体多色発光素子
特許 3767491　窒化ガリウム系化合物半導体発光素子
特許 3767534　発光デバイス
特許 3770014　窒化物半導体素子
特許 3772651　窒化物半導体レーザ素子
特許 3772807　窒化ガリウム系化合物半導体発光素子
特許 3775259　窒化物半導体レーザ素子
特許 3786000　窒化物半導体レーザダイオードとその製造方法
特許 3794530　窒化物半導体レーザ素子
特許 3800146　窒化物半導体素子の製造方法
特許 3801353　窒化物半導体発光素子
特許 3808892　発光ダイオード
特許 3809749　窒化物半導体発光素子
特許 3835225　窒化物半導体発光素子
特許 3835384　窒化物半導体素子
特許 3835446　窒化物半導体発光素子
特許 3847000　窒化物半導体基板上に活性層を備えた窒化物半導体層を有する窒化物半導体素子及びその
特許 3857417　窒化物半導体素子
特許 3859356　窒化物半導体素子の製造方法
特許 3867625　窒化物半導体発光素子
特許 3876518　窒化物半導体基板の製造方法および窒化物半導体基板
特許 3884717　窒化ガリウム系化合物半導体の製造方法
特許 3885092　窒化物半導体レーザ素子およびその共振面の作製方法
特許 3888036　ｎ型窒化物半導体の成長方法
特許 3888170　窒化物半導体レーザ素子
特許 3891108　窒化物半導体発光素子
特許 3893614　窒化物半導体レーザ素子のストライプ導波路の側面及び窒化物半導体層の平面に絶縁性の
特許 3920296　発光ダイオード
特許 3924973　窒化物半導体発光素子の製造方法および窒化物半導体発光素子
特許 3928621　発光素子用ウエハー

特許 3938101	発光素子の製造方法
特許 3941464	窒化物半導体発光素子の製造方法
特許 3951973	窒化物半導体素子
特許 3952079	窒化物半導体発光素子の製造方法
特許 3953077	窒化ガリウム系化合物半導体発光素子
特許 3956753	窒化ガリウム系化合物半導体発光素子
特許 3972943	窒化ガリウム系化合物半導体発光素子
特許 3992027	窒化物半導体レーザ素子
特許 3995011	発光ダイオード
特許 4028635	窒化物半導体発光素子
特許 4032836	窒化物半導体レーザ素子
特許 4043087	窒化物半導体素子の製造方法及び窒化物半導体素子
特許 4046114	窒化物半導体の成長方法及び窒化物半導体素子
特許 4053747	窒化物半導体レーザ素子
特許 4072202	窒化物半導体レーザ素子
特許 4109297	発光ダイオード
特許 4120698	窒化物半導体レーザ素子
特許 4131101	窒化物半導体素子の製造方法
特許 4197891	窒化物半導体レーザ素子
特許 4239444	窒化物半導体レーザダイオード
特許 4254373	窒化物半導体素子
特許 4277283	窒化物半導体発光素子
特許 4285337	窒化ガリウム系化合物半導体ウエハーの製造方法
JP 4637503 B2	Nitride Semiconductor Laser Element
JP 4815734 B2	Nitride Semiconductor Laser Element
JP 4816434 B2	Nitride Semiconductor Device
JP 4825218	Control of Photoelectrochemical (PEC) Etching by Modification of the Local Electrochemical Potential of the Semiconductor Structure Relative to the Electrolyte