Shuji Nakamura, Ph.D.

Professor of Materials Department
Co-Director, Solid State Lighting and Energy Electronics Center
University of California, Santa Barbara
Santa Barbara, CA 93106-5050
e-mail: snakamura@ucsb.edu

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

APPOINTMENTS

1999 – Present	University of California, Santa Barbara Professor, Materials Department
2022 - Present	Co-founder, CEO Blue Laser Fusion Inc.,
2015-2021	Co-Founder, Chief Technology Officer (CTO) SLD Laser
2008-2019	Co-Founder, Soraa Inc.
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
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 Medal 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 Fellow
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
2011	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
2014	Order of Culture Award, Japan
2014	National Academy of Inventors (NAI) Member
2014	Goleta's Finest – Special Recognition by the Goleta Chamber of Commerce
2015	Charles Stark Draper Prize for Engineering
2015	National Academy of Inventors Fellow
2015	Japanese Science of Applied Physics (JSAP) Honorary Member
2015	National Inventors Hall of Fame
2015	Physical Society of Japan Honorary Member
2015	Pioneer Award, 21st annual South Coast Business & Technology Awards
2015	Global Energy Prize
2015	Asia Game Changer
2015	Eagle on the World
2015	Japanese Illuminating Engineering Institute Honorary Member
2015	Japanese Institute of Electronics and information Honorary Member
2015	Japanese Institute of Electrical and Electronic Engineering Honorary Member
2015	AAEOY Distinguished Science and Technology Award in Los Angeles
2015	Doctor Honoris Cause from Wroclaw University in Poland
2016	The Asian Award/Outstanding Achievement in Science & Technology, London, England
2016	The Nelson W. Taylor Keynote Award, The Pennsylvania State University
2016	Asian & Pacific Islander American (APIA) Heritage Award, Sacramento, CA
2016	Ordine dei Santi Mauizio e Lazzaro
2017	Academia Sinica Fellow, Taiwan

2017	Mountbatten Medal Achievement Award, Institute of Engineering and Technology, England
2017	Asia Pacific Brands Foundation Awards: Legendary Award
2017	Doctor Honoris Causa from University of Warsaw in Poland
2017	Honorary Fellowship Awards from Hong Kong Baptist University ACKM
2017	Doctor Honoris Causa from Universidad International Menendez Pelayo in Spain
2018	Zayed Future Energy Prize Lifetime Achievement, United Arab Emirates
2018	Honorary Doctorate Degree from University of Massachusetts Lowell
2018	10th Iwaki Award in Japan
2018	Degree of Doctor of Science in Engineering (Honoris cause) for distinction in engineering from Queen's University Belfast
2019	Consumer Technology Association (CTA) Celebrate 20th Anniversary of Hall of Fame
2019	Royal Academy of Engineering Fellow
2019	Honorary Doctorate of Science, Universiti Sains Malaysia
2019	Honoris Causa in Toulouse, France
2019	Honorary Doctoral degree from UMass Lowell
2019	The University of Perugia awarded the Honorary Doctorate in Energy and Sustainable Development
2020	2019 Leigh Ann Conn Prize for Renewable Energy (March 2020)
2020	National Academy of Science (NAS) Award for the Industrial Application of Science
2021	3rd Annual Richard J. Goldstein Energy Lecture Award from the American Society of Mechanical Engineers (ASME)
2021	Queen Elizabeth Prize for Engineering
2023	LpS Digital Achievement Award
2024	Engineering and Science Hall of Fame® (ESHF)

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, UCSB
2007 – 2013	Research Director, Solid State Lighting and Energy Center, UCSB
2014 – Present	Research Director, Solid State Lighting and Energy Electronics Center, UCSB
2000	Editorial Board, Compound Semiconductor Magazine

2001	Editor, Materials Research Society Conference Proceedings
2001 – 2007	Director, Exploratory Research for Advanced Technology (ERATO), UCSB
2002	Guest Professor, Shinshu University (Japan)
2004	Guest Professor, Tottori University (Japan)
2004	Honorary Professor, Universtät Bremen (Germany)
2004	Guest Professor, University of Tokushima (Japan)
2005	Honorary Professor, Wuhan University (China)
2007	Visiting Honorary Professor, Hong Kong University of Science & Technology
2008	Honorary Graduates: Doctor of Engineering honoris causa, Hong Kong University of Science and Technology
2007	Guest Professor, University of Ehime (Japan)
2009	Advisor, Shanghai Research Center of Engineering and Technology for Solid-State Lighting (China)
2009	Advisory Professor, Fudan University (China)
2015	Distinguished Professor, Tokyo University of Agriculture and Technology(Japan)
2015	Doctor Honoris Causa, University of Wroclaw, Poland
2016	University of Michigan Dow Lectureship
2016	GLOBALFOUNDRIES Fab8
2016	Honorary Degree, McGill University, Montreal, Canada
2016	Cohen Distinguished Lecturer, Northwestern University
2016	Gurevitch Lecture, Portland State University, OR
2016	Keynote, International Conference on Physics, New Orleans, LA
2016	Keynote, ICEM2016 Conference, Singapore
2016	Keynote, 2016 QMS symposium, NY
2016	2016 CPS (Chinese Physical Society), Beijing University of Technology, China
2016	LpS 2016 venue, St. Petersburg, Russia
2016	DLS, University of Wisconsin-La Crosse
2016	CeOPP (Center of Optoelectronics and Photonics Paderborn), University of Paderborn, Germany
2016	Nelson W. Taylor Lecturer at Penn State's University Park
2016	Honorary Professor of China University of Mining and Technology
2017	Honorary Academician, Academia Sinica, Taiwan
2017	Doctorado Honoris Causa, Universidad Internacional Menéndez Pelayo (UIMP), Spain
2017	Honorary Fellowship Awards from Hong Kong Baptist University ACKM

2017	The Doctorate Honoris, University of Warsaw (Poland)
2017	Invited Speaker, Military University of Technology (aka Wojskowa Akademia Techniczna), Warsaw, Poland
2018	Honorary Degree, University of Massachusetts Lowell
2019	Leigh Ann Conn Prize for Renewable Energy
2019	Honorary Degree of Doctor of Science from the Universiti Sains Malaysia
2019	2019 Consumer Technology (CT) Hall of Fame
2019	Royal Academy of Engineering Member
2020	National Academy of Science (NAS) Award for the Industrial Application of Science
2021	Queen Elizabeth Prize for Engineering
2023	LpS Digital Awards 2023, Achievement Award
2024	Engineering and Science Hall of Fame® (ESHF)

PUBLICATIONS: **(**Last updated 06/30/2024)

No.	Year	Authors and Title	Publisher	Category
1.	1989	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*, Vol. 97, pp. 303-309	Journal
2.	1990	S. Nakamura, H. Takagi **"High-power and high-efficiency P-GaAlAs/N-GaAs: Si single herterostucture infrared emitting diodes"**	*Jpn. J. Appl. Phys.,* Vol. 29 No. 12, pp. 2694-2697	Journal
3.	1991	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	Journal
4.	1991	S. Nakamura **"Analysis of real-time monitoring using interference effects"**	*Jpn. J. Appl. Phys.,* Vol. 30 No. 7, pp.1348-1353	Journal

5.	1991	S. Nakamura **"*In situ* monitoring of GaN growth using interference effects"**	*Jpn. J. Appl. Phys.,* Vol. 30 No. 8, pp. 1620-1628	Journal
6.	1991	S. Nakamura **"GaN growth using GaN buffer layer"**	*Jpn. J. Appl. Phys.,* Vol. 30 No. 10A, pp. L1705-L1707	Journal
7.	1991	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	Journal
8.	1991	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	Journal
9.	1992	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	Journal
10.	1992	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	Journal
11.	1992	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	Journal
12.	1992	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	Journal
13.	1992	S. Nakamura, T. Mukai **"High-quality InGaN films grown on GaN films"**	*Jpn. J. Appl. Phys.,* Vol. 31 No. 10B, pp. L1457-L1459	Journal
14.	1993	S. Nakamura, M. Senoh, T. Mukai **"p-GaN/N-InGaN/N-GaN double-**	*Jpn. J. Appl. Phys.,* Vol. 32 No. 1A/B. pp. L8-L11	Journal

		heterostructure blue-light-emitting diodes"		
15.	1993	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	Journal
16.	1993	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	Journal
17.	1993	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	Journal
18.	1993	S. Nakamura **"InGaN blue-light-emitting diodes"**	*Journal of the Institute of Electronics, Information and Communication Engineers,* Vol. 76 No. 9, pp. 3911-3915	Journal
19.	1993	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	Journal
20.	1994	S. Nakamura **"Blue LEDs, realization of LCD by double-heterostructure"**	No. 602, pp. 93-102	
21.	1994	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	Journal
22	1994	S. Nakamura **"Nichia's 1cd blue LED paves way for full-color display"**	*Nikkei Electronics Asia*, June 1994	Magazine

23.	1994	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	Conference Proceeding
24.	1994	S. Nakamura **"Realized high bright blue laser-emitting diodes"**	*Scientific American,* October 1994	Magazine
25.	1994	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	Journal
26.	1994	S. Nakamura **"Zn-doped InGaN growth and InGaN/AlGaN double-heterostructure blue-light-emitting diodes"**	*J. Cryst. Growth,* Vol. 145, pp. 911-917	Journal
27.	1994	S. Nakamura **"InGaN/AlGaN double-heterostructure blue LEDs"**	*Mat. Res. Symp. Proc.,* Vol. 339, pp. 173-178	Journal
28.	1994	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	Journal
29.	1995	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	Journal
30.	1995	S. Nakamura **"Highly luminous III-V nitride-based devices head for the highway, color displays"**	*IEEE*, May 1995	Journal
31.	1995	S. Nakamura **"InGaN/AlGaN blue-light-emitting diodes"**	*J. Vac. Sci. & Tech. A,* Vol. 13 No. 3, pp. 705-710	Journal

32.	1995	S. Nakamura, M. Senoh, N. Iwasa, S. Nagahama **"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	Journal
33.	1995	S. Nakamura **"LED full color display"**	*IEICE*, Vol. 78, No. 7, pp. 683-688	Journal
34.	1995	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)	Conference Proceeding
35.	1995	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	Journal
36.	1995	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	Journal
37.	1995	S. Nakamura **"Laser diodes and progress of InGaN-based IV-V system LED"**	*Optik*, Vol. 24, No. 11, pp. 673-678	Journal
38.	1995	T. Azuhata, T. Soto, K. Suzuki, S. Nakamura **"Polarized Raman Spectra in GaN"**	*J. Phys. Condens. Matter*, Vol. 7 No. 10, pp. L129-L133	Journal
39.	1995	S. Nakamura **"III-V Nitride light-emitting diodes"**	*OSA Proceedings on Advanced Solid-State Lasers,* Vol. 24, pp. 20-24	Journal
40.	1995	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	Journal

41.	1995	S. Nakamura **"Recent developments of GaN based LEDs"**	*Proceedings of Topical Workshop on III-V Nitrides*, pp. 11-14	Conference Proceedings
42.	1996	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	Conference Proceedings
43.	1996	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	Journal
44.	1996	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	Journal
45.	1996	S. Nakamura **"Pulsed operation of violet laser diodes"**	*Electr. Mater.,March issue,* pp. 159-164	Journal
46.	1996	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	Journal
47.	1996	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	Journal

48.	1996	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	Journal
49.	1996	S. Nakamura **"InGaN-based blue/green LEDs and laser diodes"**	*Adv. Mater.,* Vol. 8 No. 8, pp. 689-692	Journal
50.	1996	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	Journal
51.	1996	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	Journal
52.	1996	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	Journal
53.	1996	S. Nakamura **"Present status and future prospects of GaN-based light emitting devices"**	*Jpn. Soc. Appl. Phys.*, Vol. 65 No. 7, pp. 676-685	Journal
54.	1996	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	Journal
55.	1996	S. Nakamura **"Fabrication of blue and green nitride light-emitting diodes"**	*Inst. Phys. Conf. Ser. No. 142,* Chapter 6	Conference Proceeding
56.	1996	S. Nakamura **"III-V nitride-based light-emitting diodes"**	*Diamond and Related Materials,* Vol. 5 Issue 1-3, pp. 496-500	Journal

57.	1996	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	Journal
58.	1996	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	Journal
59.	1996	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	Conference Proceedings
60.	1996	S. Nakamura **"InGaN light-emitting diodes with quantum-well structures"**	*Mat. Res. Soc. Symp. Proc.* 395, pp. 879-887	Conference Proceedings
61.	1996	S. Nakamura **"High-brightness blue-green LEDs and first III-V nitride-based laser diodes"**	*Proceedings of SPIE,* Vol. 2693, pp. 43-56	Conference Proceedings
62.	1996	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	Conference Proceedings
63.	1996	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	Conference Proceedings
64.	1996	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	Journal

65.	1996	S. Nakamura **"III-V nitride based blue/green LEDs and LDs"**	*23rd ICPS Proc.*, Berlin, July 21-26, Vol. 1, pp. 11-18	Conference Proceedings
66.	1996	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	Conference Proceedings
67.	1996	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	Conference Proceedings
68.	1996	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	Journal
69.	1996	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	Journal
70.	1996	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	Journal
71.	1997	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	Journal

72.	1997	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	Journal
73.	1997	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	Journal
74.	1997	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	Journal
75.	1997	S. Nakamura **"Blue-green light-emitting diodes and violet laser diodes"**	*MRS Bulletin*, Vol. 22 No. 2, pp. 29-35	Journal
76.	1997	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	Journal
77.	1997	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	Journal
78.	1997	S. Nakamura **"GaN-based blue/green semiconductor laser"**	*IEEE Journal of Selected Topics in Quantum Electronics*, Vol. 36 No. 3B, pp. 435-442	Journal

79.	1997	S. Chichibu, T. Azuhata, T. Sota, S. Nakamura **"Optical properties of InGaN"**	*Bulletin of Solid State Physics and Applications*	Journal
80.	1997	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*	Journal
81.	1997	S. Nakamura "Characteristics of RT-CW operated bluish-purple laser diodes"	*Bulletin of Solid State Physics and Applications*	Journal
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603	2016	"High Gain Semiconductor Optical Amplifier - Laser Diode at Visible" Chao Shen, Changmin Lee, Tien Khee Ng, Shuji Nakamura, James S. Speck, Steven P. DenBaars	*Proc. of IEEE*	RP
604	2016	"High luminous efficacy green light-emitting diodes with AlGaN cap layer "Abdullah I. Alhassan, Robert M. Farrell, Burhan Saifaddin, Asad Mughal, Feng Wu, Steven P. DenBaars, Shuji Nakamura, and James S. Speck	*OPTICS EXPRESS **24**, 17868*	Journal
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627	2016	"Silver free III-nitride flip chip light-emitting-diode with wall plug efficiency over 70% utilizing a GaN tunnel junction" B. P. Yonkee, E. C. Young, S. P. DenBaars, S. Nakamura, and J. S. Speck	*Appl. Phys. Lett. **109**, 191104*	Journal
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629	2016	"Study of Low-Efficiency Droop in Semipolar (2021)InGaN Light-Emitting Diodes by Time-Resolved Photoluminescence" Houqiang Fu, Zhijian Lu, Xin-Hao Zhao, Yong-Hang Zhang, *Fellow, IEEE*, Steven P. DenBaars, *Fellow, IEEE*,Shuji Nakamura, and Yuji Zhao	*JOURNAL OF DISPLAY TECHNOLOGY, **12**, 736*	Journal
630	2016	"Tunnel junction devices with monolithic optically pumped and electrically injected InGaN quantum wells for polarized white light emission" Kowsz, Stacy; Pynn, Christopher; Farrell, Robert; et al	*Proc. of IPRM/ISCS*	RP
631	2016	"Using band engineering to tailor the emission spectra of trichromatic semipolar InGaN light-emitting diodes for phosphor-free polarized white light emission" S. J. Kowsz, C. D. Pynn, S. H. Oh, R. M. Farrell, S. P. DenBaars, and S. Nakamura	*Journal of Applied Physics **120**, 033102*	Journal
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634	2017	"Efficient Semipolar (11−22) 550 nm Yellow/Green InGaN Light-Emitting Diodes on Low Defect Density (11−22) GaN/SapphireTemplates" Hongjian Li, Michel Khoury, Bastien Bonef, Abdullah I. Alhassan, Asad J. Mughal, Ezzah Azimah, Muhammad E.A. Samsudin, Philippe De Mierry, Shuji Nakamura, James S. Speck, and Steven P. DenBaars	*ACS Appl. Mater. Interfaces 2017, **9**, 36417-36422*	Journal
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736	2020	"Size-independent low voltage of InGaN micro-light-emitting diodes with epitaxial tunnel junctions using selective area growth by metalorganic chemical vapor deposition" Li, Panpan; Zhang, Haojun; Li, Hongjian; et al.	*Optics Express **28**, 13*	Journal
737	2020	"Revealing the importance of light extraction efficiency in InGaN/GaN microLEDs via chemical treatment and dielectric passivation" Ley, Ryan T.; Smith, Jordan M.; Wong, Matthew S.; et al.	*Applied Physics Letters **116**, 25*	Journal
738	2020	"7.4-Gbit/s Visible-Light Communication Utilizing Wavelength-Selective Semipolar Micro- Photodetector" Omar Alkhazragi, Chun Hong Kang, Meiwei Kong, Guangyu Liu, Changmin Lee, Kuang-Hui Li, Huafan Zhang, Jonathan M.	*IEEE Photonics Technology Letters, **32**, 767*	AJ

		Wagstaff, Fatimah Alhawaj, Tien Khee Ng, James S. Speck, Shuji Nakamura, Steven P. DenBaars, and Boon S. Ooi		
739	2020	"Flow modulation metalorganic vapor phase epitaxy of GaN at temperatures below 600 ºC" Caroline E Reilly, Thomas E Mates, Micah Webb, Shuji Nakamura, Steven P DenBaars, and Stacia Keller	*Semiconductor Science and Technology, **35**, 095014*	AJ
740	2020	"Dependence of carrier escape lifetimes on quantum barrier thickness in InGaN/GaN multiple quantum well photodetectors" Yi Chao Chow, Changmin Lee, Matthew S. Wong, Yuh-Renn Wu, Shuji Nakamura, Steven P. DenBaars, John E. Bowers, and James S. Speck	*Optics Express, **28**, 23796*	AJ
741	2020	"Method of growing elastically relaxed crack-free AlGaN on GaN as substrates for ultra-wide bandgap devices using porous GaN" Shubhra S. Pasayat, Nirupam Hatui, Weiyi Li, Chirag Gupta, Shuji Nakamura, Steven P. Denbaars, Stacia Keller, and Umesh K. Mishra	*Applied Physics Letters, **117**, 062102*	AJ
742	2020	"Color-tunable <10 μm square InGaN micro-LEDs on compliant GaN-on-porous-GaN pseudo- substrates" Shubhra S. Pasayat, Ryan Ley, Chirag Gupta, Matthew S. Wong, Cheyenne Lynsky, Yifan Wang, Michael J. Gordon, Shuji Nakamura, Steven P. Denbaars, Stacia Keller, and Umesh K. Mishra	*Applied Physics Letters, **117**, 061105*	AJ
743	2020	"High Performance Green LEDs for Solid State Lighting" Shuji Nakamura, James Speck, Leah Kuritzky, Steven DenBaars, Claude Weisbuch, Ramunas Aleksiejunas, Cheynne Lynsky, Abdullah Alhassan, Bastien Bonef, Guillaume Lheureux, Saulius Marcinkevičius	*Department of Energy*	Report
744	2020	"Superlattice hole injection layers for UV LEDs grown on SiC" Christian J. Zollner, Abdullah S. Almogbel, Yifan Yao, Michael Wang, Michael Iza, James S. Speck, Steven P. DenBaars, and Shuji Nakamura	*Optical Materials Express, **10**, 2171*	AJ

745	2020	"Transmission Geometry Laser Lighting with a Compact Emitter" Caroline E. Reilly, Guillaume Lheureux, Clayton Cozzan, Emet Zeitz, Tal Margalith, Shuji Nakamura, Ram Seshadri, Claude Weisbuch, and Steven P. DenBaars	*Physica Status Solidi A,* ***217****, 2000391*	AJ
746	2020	"High performance of a semipolar InGaN laser with a phase-shifted embedded hydrogen silsesquioxane (HSQ) grating" Haojun Zhang, Daniel A. Cohen, Philip Chan, Matthew S. Wong, Panpan Li, Hongjian Li, Shuji Nakamura, and Steven P. Denbaars	*Optics Letters,* ***45****, 5844*	AJ
747	2020	"Metalorganic chemical vapor deposition grown n- InGaN/n-GaN tunnel junctions for micro-light- emitting diodes with very low forward voltage" Panpan Li, Haojun Zhang, Hongjian Li, Yuewei Zhang, Yifan Yao, Nathan Palmquist, Mike Iza, James S Speck, Shuji Nakamura, and Steven P DenBaars	*Semiconductor Science and Technology,* ***35****, 125023*	AJ
748	2020	"High polarization and fast modulation speed of dual wavelengths electroluminescence from semipolar (20-21) micro light-emitting diodes with indium tin oxide surface grating" Haojun Zhang, Panpan Li, Hongjian Li, Jie Song, Shuji Nakamura, and Steven P. DenBaars	*Applied Physics Letters,* ***117****, 181105*	AJ
749	2020	"Impact of Alloy-Disorder-Induced Localization on Hole Diffusion in Highly Excited *c*-Plane and *m*- Plane (In,Ga)N Quantum Wells" Ramunas Aleksiejunas, Kazimieras Nomeika, Oleg Kravcov, Saulius Nargelas, Leah Kuritzky, Cheyenne Lynsky, Shuji Nakamura, Claude Weisbuch, and James S. Speck	*Physical Review Applied,* ***14****, 054043*	AJ
750	2020	"Disorder effects in nitride semiconductors: impact on fundamental and device properties" Claude Weisbuch, Shuji Nakamura, Yuh-Renn Wu, and James S. Speck	*Nanophotonics,* ***10****, 3-21*	AJ

751	2020	"MOCVD growth of thick V-pit-free InGaN films on semi-relaxed InGaN substrates" Ryan C White, Michel Khoury, Feng Wu, Stacia Keller, Mariia Rozhavskaia, David Sotta, Shuji Nakamur, and Steven P DenBaars	*Semiconductor Science and Technology, **36**, 015011*	AJ
752	2020	"Optimization of barrier height in InGaN quantum wells for rapid interwell carrier transport and low nonradiative recombination" Rinat Yapparov, Cheyenne Lynsky, Shuji Nakamura, James S. Speck, and Saulius Marcinkevičius	*Applied Physics Express, **13**, 122005*	AJ
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754	2020	"Review-Progress in High Performance III-Nitride Micro-Light-Emitting Diodes" Matthew S. Wong, Shuji Nakamura, and Steven P. DenBaars	*ECS Journal of Solid State Science and Technology, **9**, 015012*	AJ
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756	2021	"Toward heteroepitaxially grown semipolar GaN laser diodes under electrically injected continuous- wave mode: From materials to lasers" Hongjian Li, Haojun Zhang, Jie Song, Panpan Li, Shuji Nakamura, and Steven P. DenBaars	*Applied Physics Reviews 7, 041318*	AJ
757	2021	"High external quantum efficiency III-nitride micro- light-emitting diodes" Matthew S. Wong, Shuji Nakamura, and Steven P. DenBaars	*Semiconductors and Semimetals, **106**, 95-121*	AJ
758	2021	"Demonstration of high wall-plug efficiency III- nitride micro-light-emitting diodes with MOCVD- grown tunnel junction contacts using chemical treatments" Matthew S. Wong, Joonho Back, David Hwang, Changmin Lee, Jianfeng Wang, Srinivas Gandrothula, Tal Margalith, James S. Speck, Shuji	Applied Physics Express, 14, 086502	AJ

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759	2021	"High efficiency blue InGaN microcavity light- emitting diode with a 205 nm ultra-short cavity" Joonho Back, Matthew S. Wong, Steven P. DenBaars, Claude Weisbuch, and Shuji Nakamura	*Applied Physics Letters,* ***118,*** *031102*	AJ
760	2021	"Enhanced external quantum efficiency of III-nitride micro-light-emitting diodes using vertical and transparent package" Matthew S. Wong, Sang Ho Oh, Joonho Back, Changmin Lee, James S. Speck, Shuji Nakamura, and Steven P. DenBaars	*Japanese Journal of Applied Physics,* ***60,*** *020905*	AJ
761	2021	"Metalorganic chemical vapor deposition-grown tunnel junctions for low forward voltage InGaN light-emitting diodes: epitaxy optimization and light extraction simulation" Panpan Li, Hongjian Li, Haojun Zhang, Mike Iza, James S Speck, Shuji Nakamura, and Steven P DenBaars	*Semiconductor Science and Technology,* ***36,*** *035019*	AJ
762	2021	"Study of surface roughness of lifted-off epitaxial lateral overgrown GaN layers for the n-DBR mirror of a III-nitride vertical-cavity surface emitting laser" Srinivas Gandrothula, Takeshi Kamikawa, James S. Speck, Shuji Nakamura, and Steven P. DenBaars	*Applied Physics Express,* ***14,*** *031002*	AJ
763	2021	"Blue semipolar InGaN microcavity light-emitting diode with varying cavity lengths from 113 to 290 nm" Joonho Back, Vincent Rienzi, Matthew S. Wong, Hongjian Li, Steven P. DenBaars, Claude Weisbuch, and Shuji Nakamura	*Applied Physics Express,* ***14,*** *042003*	AJ
764	2021	"III-nitride strain relaxation enabled by porous GaN for optoelectronic applications" Shubhra Pasayat, Chirag Gupta, Matthew Wong, Ryan Ley, Yifan Wang, Stacia Keller, Steven P. DenBaars, Shuji Nakamura, and Umesh K. Mishra	*SPIE OPTO,* ***11706***	CP
765	2021	"Acousto-fluidic assembly of III-nitride micro-light- emitting diodes with magnetic alignment" Matthew S. Wong, Drew Melchert, Michael Haggmark, Daniel J. Myers, Srinivas Grandrothula, Mattanjah de Vries, Daniel	*SPIE OPTO,* ***11706,*** *1170607*	CP

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766	2021	"Growth by MOCVD and photoluminescence of semipolar (2021) InN quantum dashes" Philip Chan, Caroline E. Reilly, Stacia Keller, Steven P. DenBaars, and Shuji Nakamura	*Journal of Crystal Growth, **563**, 126093*	AJ
767	2021	"High efficiency of III-nitride and AlGaInP micro- light-emitting diodes using atomic layer deposition" Matthew Wong, James Speck, Shuji Nakamura, and Steven DenBaars	*Proceedings of SPIE, **11706**, 117060B*	CP
768	2021	"Morphological improvement and elimination of V- pits from long-wavelength all-InGaN based uLEDs grown by MOCVD on compliant substrates" Ryan C. White, Michel Khoury, Matthew S. Wong, Stacia Keller, David Sotta, Shuji Nakamura, and Steven P. DenBaars	*SPIE OPTO, **11686**, 116861N*	CP
769	2021	"New fabrication method of InGaN laser diode by epitaxial lateral overgrowth and cleavable technique from free-standing non- and semi-polar GaN substrate" Takeshi Kamikawa, Srinivas Gandrothula, Hongjian Li, V. Bonito Oliva, Feng Wu, Daniel Cohen, James S. Speck, Steven P. Denbaars, and Shuji Nakamura	*Proceedings of SPIE, **11686**, 116860M*	CP
770	2021	"InN Quantum Dots by Metalorganic Chemical Vapor Deposition for Optoelectronic Applications" Caroline E. Reilly, Stacia Keller, Shuji Nakamura, and Steven P. DenBaars	*Frontiers in Materials, **8**, 647936*	Review
771	2021	"Damage-free substrate removal technique: wet undercut etching of semipolar (2021) laser structures by incorporation of un/relaxed sacrificial layer single quantum well" Arwa Saud Abbas, Ahmed Y. Alyamani, Shuji Nakamura, and Steven P. Denbaars	*Japanese Journal of Applied Physics, **60**, 050901*	AJ

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773	2021	"Controlling Spontaneous Emission with Nanohole- Based Phased-Array Metasurfaces" Yahya Mohtashami, Larry K. Heki, Abdullah Alhassan, Shuji Nakamura, Steven P. DenBaars, and Jon A. Schuller	*CLEO 2020*	AJ
774	2021	"Growth by MOCVD and photoluminescence of semipolar (2021) InN quantum dashes" Philip Chan, Caroline E. Reilly, Stacia Keller, Steven P. DenBaars, and Shuji Nakamura	*Journal of Crystal Growth, **563**, 126093*	AJ
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777	2021	"Demonstration of high efficiency cascaded blue and green micro-light-emitting diodes with independent junction control" Panpan Li, Hongjian Li, Yifan Yao, Haojun Zhang, Cheyenne Lynsky, Kai Shek Qwah, James S. Speck, Shuji Nakamura, and Steven P. DenBaars	*Applied Physics Letters, **118**, 261104*	AJ
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779	2021	"Patterned III-Nitrides on Porous GaN: Extending ElasticRelaxation from the Nano- to the Micrometer Scale" Stacia Keller, Shubhra S. Pasayat, Chirag Gupta, Steven P. DenBaars, Shuji Nakamura, and Umesh K. Mishra	*Physica Status Solidi RRL, **15**, 2100234*	AJ
780	2021	"Metalorganic chemical vapor deposition of InN quantum dots and nanostructures" Caroline E. Reill, Stacia Keller, Shuji Nakamura, and Steven P. DenBaars	*Light: Science & Applications, **10**, 150*	AJ
781	2021	"High internal quantum efficiency of long wavelength InGaN quantum wells" Saulius Marcinkevičius, Rinat Yapparov, Yi Chao Chow, Cheyenne Lynsky, Shuji Nakamura, Steven P. DenBaars, and James S. Speck	*Applied Physics Letters, **119**, 071102*	AJ
782	2021	"Highly Conductive n-$Al_{0.65}Ga_{0.35}N$ Grown by MOCVD Using Low V/III Ratio" Christian J. Zollner, Yifan Yao, Michael Wang, Feng Wu, Michael Iza, James S. Speck, Steven P. DenBaars, and Shuji Nakamura	*Crystals, **11**, 1006*	AJ
783	2021	"N-face GaN substrate roughening for improved performance GaN-on-GaN LED" Ezzah Azimah Alias, Muhammad Esmed Alif Samsudin, Steven DenBaars, James Speck, Shuji Nakamura, and Norzaini Zainal	*Microelectronics International, **38**, 93-98*	AJ
784	2021	"Size-independent peak external quantum efficiency (>2%) of InGaN red micro-light-emitting diodes with an emission wavelength over 600 nm" Panpan Li, Hongjian Li, Haojun Zhang, Cheyenne Lynsky, Mike Iza, James S. Speck, Shuji Nakamura, and Steven P. DenBaars	*Applied Physics Letters, **119**, 081102*	AJ
785	2021	"Growth of highly conductive Al-rich AlGaN:Si with low group-III vacancy concentration" Abdullah S. Almogbel, Christian J. Zollner, Burhan K. Saifaddin, Michael Iza, Jianfeng Wang, Yifan Yao, Michael Wang, Humberto Foronda, Igor Prozheev, Filip Tuomisto, Abdulrahman Albadri, Shuji Nakamura, Steven P. DenBaars, and James S. Speck	*AIP Advances, **11**, 095119*	AJ

786	2021	"Realization of III-Nitride c-Plane microLEDs Emitting from 470 to 645 nm on Semi-Relaxed Substrates Enabled by V-Defect-Free Base Layers" Ryan C. White, Michel Khoury, Matthew S. Wong, Hongjian Li, Cheyenne Lynsky, Michael Iza, Stacia Keller, David Sotta, Shuji Nakamura, and Steven P. DenBaars	*Crystals, **11**, 1168*	AJ
787	2021	"Growth of highly relaxed InGaN pseudo-substrates over full 2-in. wafers" Philip Chan, Steven P. DenBaars, and Shuji Nakamura	*Applied Physics Letters, **119**, 131106*	AJ
788	2021	"Demonstration of relaxed InGaN-based red LEDs grown with high active region temperature" Philip Chan, Vincent Rienzi, Norleakvisoth Lim, Hsun-Ming Chang, Michael Gordon, Steven P. DenBaars, and Shuji Nakamura	*Applied Physics Express, **14**, 101002*	AJ
789	2021	"Optical and electrical characterizations of micro- LEDs grown on lower defect density epitaxial layers" Srinivas Gandrothula, Takeshi Kamikawa, Pavel Shapturenka, Ryan Anderson, Matthew Wong, Haojun Zhang, James S. Speck, Shuji Nakamura, and Steven P. Denbaars	*Applied Physics Letters, **119**, 142103*	AJ
790	2021	"High conductivity n-Al0.6Ga0.4N by ammonia- assisted molecular beam epitaxy for buried tunnel junctions in UV emitters" Jianfeng Wang, Burhan K. Saifaddin, Christian J. Zollner, Bastien Bonef, Abdullah S. Almogbel, Yifan Yao, Michael Iza, Yuewei Zhang, Micha N. Fireman, Erin C. Young, Steven P. DenBaars, Shuji Nakamura, and James S. Speck	*Optics Express, **29**, 40781*	AJ
791	2021	"InGaN-Based microLED Devices Approaching 1% EQE with Red 609 nm Electroluminescence on Semi-Relaxed Substrates" Ryan C. White, Hongjian Li, Michel Khoury, Cheyenne Lynsky, Michael Iza, Stacia Keller, David Sotta, Shuji Nakamura, and Steven P. DenBaars	*Crystals, **11**, 1364*	AJ
792	2021	"Effects of activation method and temperature to III- nitride micro-light-emitting diodes with tunnel junction contacts grown by metalorganic chemical vapor deposition"	*Applied Physics Letters, **119**, 202102*	AJ

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793	2021	"Properties of AlN/GaN Heterostructures Grown at Low Growth Temperatures with Ammonia and Dimethylhydrazine" Caroline E. Reilly, Nirupam Hatui, Thomas E. Mates, Pratik Koirala, Adedapo A. Oni, Shuji Nakamura, Steven P. DenBaars, and Stacia Keller	*Crystals, **11**, 1412*	AJ
794	2021	"High-temperature electroluminescence properties of InGaN red 40 × 40 μm^2 micro-light-emitting diodes with a peak external quantum efficiency of 3.2%" Panpan Li, Aurelien David, Hongjian Li, Haojun Zhang, Cheyenne Lynsky, Yunxuan Yang, Mike Iza, James S. Speck, Shuji Nakamura, and Steven P. DenBaars	*Applied Physics Letters, **119**, 231101*	AJ
795	2021	"Semipolar {2021} GaN Edge-Emitting Laser Diode on Epitaxial Lateral Overgrown Wing" Srinivas Gandrothula, Haojun Zhang, Pavel Shapturenka, Ryan Anderson, Matthew S. Wong, Hongjian Li, Takeshi Kamikawa, Shuji Nakamura, and Steven P. DenBaars	*Crystals, **11**, 1563*	AJ
796	2022	"Localization Effect in Photoelectron Transport Induced by Alloy Disorder in Nitride Semiconductor Compounds" Mylène Sauty, Nicolas M. S. Lopes, Jean-Philippe Banon, Yves Lassailly, Lucio Martinelli, Abdullah Alhassan, Yi Chao Chow, Shuji Nakamura, James S. Speck, Claude Weisbuch, and Jacques Peretti	*Condensed Matter: Mesoscale and Nanoscale Physics*	AJ
797	2022	"Demonstration of ultra-small 5 × 5 μm^2 607 nm InGaN amber micro-light-emitting diodes with an external quantum efficiency over 2%" Panpan Li, Hongjian Li, Yunxuan Yang, Haojun Zhang, Pavel Shapturenka, Matthew Wong, Cheyenne Lynsky, Mike Iza, Michael J. Gordon, James S. Speck, Shuji Nakamura, and Steven P. DenBaars	*Applied Physics Letters, **120**, 041102*	AJ

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799	2022	"Optimization of InGaN quantum well interfaces for fast interwell carrier transport and low nonradiative recombination" Rinat Yapparov, Cheyenne Lynsky, Yi-Chao Chow, Shuji Nakamura, James S. Speck, and Saulius Marcinkevičius	*SPIE OPTO 2022, **12001**, 1200104*	CP
800	2022	"Demonstration and temperature-dependent analysis of efficient semipolar violet laser diodes heteroepitaxially grown on high-quality low-cost GaN/sapphire substrates" Haojun Zhang, Hongjian Li, Panpan Li, Shuji Nakamura, and Steven DenBaars	*SPIE Photonics West 2022*	CP
801	2022	"Inverted N-polar blue and blue-green light emitting diodes with high power grown by metalorganic chemical vapor deposition" Vineeta R. Muthuraj, Caroline E. Reilly, Thomas Mates, Stacia Keller, Shuji Nakamura, and Steven P. DenBaars	*Applied Physics Metters, **120**, 101104*	AJ
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806	2022	"Size dependent characteristics of AlGaN-based deep ultraviolet micro-light-emitting-diodes" Yifan Yao, Hongjian Li, Panpan Li, Christian J. Zollner, Michael Wang, Michael Iza, James S. Speck, Steven P. DenBaars, and Shuji Nakamura	*Applied Physics Express, **15**, 064003*	AJ
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808	2022	"Improved Vertical Carrier Transport for Green III- Nitride LEDs Using (In, Ga)N Alloy Quantum Barriers" Cheyenne Lynsky, Guillaume Lheureux, Bastien Bonef, Kai Shek Qwah, Ryan C. White, Steven P. DenBaars, Shuji Nakamura, Yuh-Renn Wu, Claude Weisbuch, and James S. Speck	*Physical Review Applied, **17**, 054048*	AJ
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810	2022	"Designing Highly Directional Luminescent Phased- Array Metasurfaces with Reciprocity-Based Simulations" Larry Heki, Yahya Mohtashami, Ryan A. DeCrescent, Abdullah Alhassan, Shuji Nakamura, Steven P. DenBaars, and Jon A. Schuller	*ACS Omega, 7, 22477-22483*	AJ
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817	2022	"Demonstration of yellow (568 nm) stimulated emission from optically pumped InGaN/GaN multi-quantum wells" Li, P., Zhang, H. Li, H., Cohen, T., Anderson, R., Wong, M.S., Trageser, E., Chow, Y.C., de Vries, M., & Nakamura, S.	*Applied Physics Letters,* ***121****, 071103*	AJ
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PATENTS: (last updated 06/30/2022)

Patent	Title
US PATENTS	
5,290,393	Crystal growth method for gallium nitride-based compound semiconductor
5,334,277	Method of vapor-growing semiconductor crystal and apparatus for vapor-growing the same
5,433,169	Method of depositing a gallium nitride-based III-V group compound semiconductor crystal layer
5,468,678	Method of manufacturing P-type compound semiconductor
5,563,422	Gallium nitride-based III-V group compound semiconductor device and method of producing the same
5,578,839	Light-emitting gallium nitride-based compound semiconductor device
5,652,434	Gallium nitride-based III-V group compound semiconductor
5,734,182	Light-emitting gallium nitride-based compound semiconductor device
5,747,832	Light-emitting gallium nitride-based compound semiconductor device
5,767,581	Gallium nitride-based III-V group compound semiconductor
5,777,350	Nitride semiconductor light-emitting device
5,877,558	Gallium nitride-based III-V group compound semiconductor
5,880,486	Light-emitting gallium nitride-based compound semiconductor device
5,959,307	Nitride semiconductor device
6,078,063	Light-emitting gallium nitride-based compound semiconductor device
6,093,965	Gallium nitride-based III-V group compound semiconductor
6,153,010	Method of growing nitride semiconductors, nitride semiconductor substrate and nitride semiconductor device
6,172,382	Nitride semiconductor light-emitting and light-receiving devices
6,204,512	Gallium nitride-based III-V group compound semiconductor device and method of producing the same
6,215,133	Light-emitting gallium nitride-based compound semiconductor device
6,469,323	Light-emitting gallium nitride-based compound semiconductor device
6,507,041	Gallium nitride-based III-V group compound semiconductor
6,580,099	Nitride semiconductor light-emitting devices

6,610,995	Gallium nitride-based III-V group compound semiconductor
6,677,619	Nitride semiconductor device
7,091,514	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
7,122,844	Susceptor for MOCVD reactor
7,186,302	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
7,122,844	Susceptor for MOCVD reactor
7,208,393	Growth of planar reduced dislocation density m-plane gallium nitride by hydride vapor phase epitaxy
7,220,324	Technique for the growth of planar semi-polar gallium nitride
7,220,658	Growth of reduced dislocation density non-polar gallium nitride by hydride vapor phase epitaxy
7,223,998	White, single or multi-color light emitting diodes by recycling guided modes
7,332,365	Method for fabricating group-III nitride devices and devices fabricated using method
7,335,920	LED with current confinement structure and surface roughening
7,338,828	Growth of planar non-polar {1 -1 0 0} m-plane gallium nitride with metalorganic chemical vapor deposition (MOCVD)
7,427,555	Growth of planar, non-polar gallium nitride by hydride vapor phase epitaxy
7,480,322	Electrically-pumped (Ga,In,Al)N vertical-cavity surface-emitting laser
7,504,274	Fabrication of nonpolar indium gallium nitride thin films, heterostructures and devices by metalorganic chemical vapor deposition
7,518,159	Packaging technique for the fabrication of polarized light emitting diodes

7,550,395	Control of photoelectrochemical (PEC) etching by modification of the local electrochemical potential of the semiconductor structure relative to the electrolyte
7,575,947	Method for enhancing growth of semipolar (Al,In,Ga,B)N via metalorganic chemical vapor deposition
7,687,293	Method for enhancing growth of semipolar (Al,In,Ga,B)N via metalorganic chemical vapor deposition
7,687,813	Standing transparent mirror-less (STML) light emitting diode
7,691,658	Method for improved growth of semipolar (Al,In,Ga,B)N
7,704,331	Technique for the growth of planar semi-polar gallium nitride
7,704,763	Technique for the highly efficient gallium nitride based LED via surface roughening
7,709,284	Method for deposition of Mg Doped (Al,In,Ga, B)N layers
7,719,020	(AL, GA, IN)N and ZnO direct wafer bonding structure for optoelectronic applications and its fabrication method
7,723,746	Packaging technique for the fabrication of polarized light emitting diodes
7,755,172	Opto-electronic and electronic devices using N-face GaN substrate prepared with ammono thermal growth
7,768,024	Improved horizontal emitting, vertical emitting, beam shaped, DFB lasers over patterned substrate with multiple overgrowth
7,781,789	Transparent mirror-less (TML) light emitting diode
7,839,903	Optimization of laser bar orientation for nonpolar (Ga,Al,In,B)N diode lasers
7,842,527	MOCVD growth of high performance M-plane GAN optical devices
7,846,757	Technique for the growth and fabrication of semipolar (Ga,Al,In,B)N thin films, heterostructures, and devices
7,847,280	Nonpolar III-Nitride light emitting diodes with long wavelength emission
7,847,293	Growth of reduced dislocation density non-polar gallium nitride by hybrid vapor phaseepitaxy
7,858,996	Method for growth of semipolar (Al,In,Ga,B) N optoelectronic devices
7,868,341	Optical designs for high-efficacy white-light emitting diodes
7,956,360	Growth of planar reduced dislocation density M-plane gallium nitride by hydride vapor phase epitaxy
7,956,371	High efficiency light emitting diode (LED)
7,982,208	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
7,994,527	High light extraction efficiency light emitting diode (LED)
8,022,423	Standing transparent mirrorless light emitting diode
8,044,383	Thin P-type gallium nitride and aluminum gallium nitride electron-blocking layer free gallium nitride-based light emitting diode
8,044,417	Enhancement of optical polarization of nitride light-emitting diodes by increased indium incorporation
8,053,264	Photoelectrochemical etching of P-type semiconductor heterostructures
8,080,469	Method for increasing the area of non-polar and semi-polar nitride substrates

8,084,763	Optoelectronic device based on non-polar and semi-polar aluminum indium nitride and aluminum indium gallium nitride alloys
8,097,481	Growth of non-polar M-plane III-nitride film using metalorganic chemical vapor deposition (MOCVD)
8,110,482	Miscute semipolar optoelectronic device
8,114,698	High light extraction efficiency nitride based light emitting diode by surface roughening
8,124,991	Light emitting diodes with high extraction efficiency
8,128,756	Technique for the growth of planar semi-polar gallium nitride
8,148,244	Lateral growth method for defect reduction of semipolar nitride films
8,148,713	Method for fabrication of semipolar-(A1,In,Ga,B)N-based light emitting diodes
8,158,947	Planar nonpolar m-plane group III nitride films grown on miscute substrates
8,178,373	MOCVD growth of high performance m-plane GaN optical devices
8,183,557	(Al, In, Ga, B)N device structures on a patterned substrate
8,188,458	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
8,193,079	Method for conductivity control of semipolar (Al,In,Ga,B) N
8,203,159	Method for growth of semipolar (Al,In,Ga,B) N optoelectronic devices
8,211,723	AlxGal-x-N-cladding-free nonpolar GaN-Based laser diodes and LED's
8,227,818	Horizontal emitting, vertical emitting, beam shaped, DFB lasers fabricated by growth over patterned substrate with multiple overgrowth
8,227,819	Thin P-type GaN and AlGaN electron-blocking layer free GaN-based light emitting diodes
8,227,820	Semiconductor light-emitting device
8,253,221	Gallium nitride bulk crystals and their growth method
8,254,423	(Al, Ga, In) N Diode laser fabricated at reduced temperature
8,263,424	Opto-electronic and electronic devices using N-face GaN substrate prepared with ammonothermal growth
8,278,128	Enhancement of optical polarization of nitride light-emitting diodes by wafer miscute
8,294,166	Transparent LEDs

8,299,452	Method for fabrication of semipolar-(A1,In,Ga,B)N-based light emitting diodes
8,357,925	Optoelectronic Device Based on Non-Polar and Semi-Polr Aluminum Indium Nitride and aluminum Indium Gallium Nitride
8,368,109	Light emitting diodes with a p-type surface bonded to a transparent submount to increase light extraction efficiency
8,368,179	Method for improved growth of semipolar (al,in,ga,b)n
8,405,128	Method for enhancing growth of semipolar (al,in,ga,b)n via metalorganic chemical vapor deposition
8,481,991	Anisotropic strain control in semipolar nitride quantum wells by partially or fully relaxed aluminum indium gallium nitride
8,502,246	Fabrication of nonpolar indium gallium nitride thin films, heterostructures and devices by metalorganic chemical vapor
8,524,012	Technique for the growth of planar semi-polar gallium nitride
8,536,618	Light emitting diode structure utilizing zinc oxide nanorod arrays on one or more surfaces, and a low cost method of producing
8,541,869	Cleaved facet (Ga,Al,In)n edge-emitting laser diodes grown on semipolar {11-2n} bulk gan substrates
8,574,525	Using boron-containing compounds, gasses and fluids during ammonothermal growth of group-III nitride crystals
8,588,260	Optimization of laser bar orientation for nonpolar (Ga,Al,In,B)n diode lasers
8592802	(Al,In,Ga,B)n device structures on a patterned substrate
8,624,281	Optical designs for high-efficacy white-light emitting diodes
8,637,334	High brightness light emitting diode covered by zinc oxide layers on multiple surfaces grown in low temperature aqueous solute
8,641,823	Reactor Designs for use in Ammonthermal Growth of Group-III Nitride Crystals
8,642,993	Nonpolar III-Nitride Light Emitting Diodes With Long Wavelength Emission
8,647,967	Hexagonal wurtzite type epitaxial layer possessing a low alkali-metal concentration and method of creating the same
8,653,503	Optoelectronic Device Based on Non-Polar and Semi-Polr Aluminum Indium Nitride and aluminum Indium Gallium Nitride

8,686,397	Low Droop Light Emitting Diode Structure On Gallium Nitride Semipolar Substrates
8,686,466	Technique For The Growth And Fabrication Of Semipolar (Ga,Al,In,B) N Thin Films Heterostructures, And Devices
8,691,671	Planar Nonpolar M-Plane Group III Nitride Films Grown On Miscut Substrates
8,692,105	III-V Nitride-Based Thermoelectric Device
8,709,371	Method For Growing Group Iii-Nitride Crystals In Supercritical Ammonia Using An Autoclave
8,709,925	Method For Conductivity Control Of Semipolar (Al,In,Ga,B)N
8,729,671	Method for increasing the area of non-polar and semi-polar gan substrates
8,761,218	Aluminum gallium nitride barriers and separate confinement heterostructure (SCH) layers for semipolar plane III-nitride
8,766,296	Highly Efficient Gallim Nitride Based Light Emitting Diodes Via Surface Roughening
8,709,925	Suppression of inclined defect formation and increase in critical thickness by silicon doping on non-c-plane (Al,Ga,In)N
8,729,671	(Al,Ga,In)N Diode Laser Fabricated At Reduced Temperature
8,761,218	Aluminum gallium nitride barriers and separate confinement heterostructure (SCH) layers for semipolar plane III-nitride semiconductor-based light emitting diodes and laser diodes
8,766,296	Highly efficient gallium nitride based light emitting diodes via surface roughening
8,772,758	Suppression of inclined defect formation and increase in critical thickness by silicon doping on non-c-plane (Al,Ga,In)N
8,790,943	(Al,Ga,In)N diode laser fabricated at reduced temperature
8,791,000	Planar nonpolar group-III nitride films grown on miscut substrates
8,795,430	Method of improving surface morphology of (Ga,Al,In,B)N thin films and devices grown on nonpolar or semipolar (Ga,Al,In,B)N substrates
8,795,440	Growth of non-polar M-plane III-nitride film using metalorganic chemical vapor deposition (MOCVD)
8,809,867	Dislocation reduction in non-polar III-nitride thin films
8,835,200	High light extraction efficiency nitride based light emitting diode by surface roughening
8,835,959	Transparent light emitting diodes
8,841,691	Light emitting diode structure utilizing zinc oxide nanorod arrays on one or more surfaces, and a low cost method of producing

8,853,669	Limiting strain relaxation in III-nitride heterostructures by substrate and epitaxial layer patterning
8,860,051	Textured phosphor conversion layer light emitting diode
8,866,126	Anisotropic Strain Control In Semipolar Nitride Quantum Wells By Partially Or Fully Relaxed Aluminum Indium Gallium Nitride
8,866,149	Method For The Reuse Of Gallium Nitride Epitaxial Substrates
8,882,935	Fabrication of nonpolar indium gallium nitride thin films, heterostructures and devices by metalorganic chemical vapor
8,956,896	Metalorganic Chemical Vapor Deposition (Mocvd) Growth Of High Performance Non-Polar III-Nitride Optical Devices
9,039,834	Non-polar gallium nitride thin films grown by metalorganic chemical vapor deposition
9,040,326	High Light Extraction Efficiency Nitride Based Light Emitting Diode By Surface Roughening
9,040,327	Alxgal-X-N-Cladding-Free Nonpolar III-Nitride Based Laser Diodes And Light Emitting Diodes
9,054,498	(Al,Ga,In)N Diode Laser Fabricated At Reduced (Al,Ga,In)N Diode Laser Fabricated At Reduced Temperature
9,077,151	Semi-Polar III-Nitride Optoelectronic Devices On M-Plane Substrates With Miscuts Less Than +/-15 Degrees In The C-Direction
9,130,119	Non-Polar And Semi-Polar Light Emitting Devices
9,133,564	Ammonothermal Growth Of Group-Iii Nitride Crystals On Seeds With At Least Two Surfaces Making An Acute, Right Or Obtuse
9,136,673	Structure and method for the fabrication of a gallium nitride vertical cavity surface emitting laser
9,147,733	Method For The Reuse Of Gallium Nitride Epitaxial Substrates
9,159,553	Semipolar nitride-based devices on partially or fully relaxed alloys with misfit dislocations at the heterointerface
9,219,205	Optical Designs For High-Efficacy White-Light Emitting Diodes
9,231,376	Technique For The Growth And Fabrication Of Semipolar (Ga,Al,In,B) N Thin Films Heterostructures, And Devices
9,240,529	Textured Phosphor Conversion Layer Light Emitting Diode
9,243,344	Gallium Nitride Bulk Crystals And Their Growth Method
9,340,899	Planar Nonpolar Group-III Nitride Films Grown On Miscut Substrates
9,356,431	High Power Blue-Violet III-Nitride Semipolar Laser Diodes
9,396,943	Method For The Reuse Of Gallium Nitride Epitaxial Substrates
9,515,240	Optical Designs For High-Efficacy White-Light Emitting Diodes

9,551,088	Method For Growing Group Iii-Nitride Crystals In Supercritical Ammonia Using An Autoclave
9,640,947	Structure and method for the fabrication of a gallium nitride vertical cavity surface emitting laser
9,773,704	Method for the Reuse of Gallium Nitride Epitaxial Substrates
9,793,435	Technique for the Growth and Fabrication of Semipolar (Ga, Al, In, B) N Thin Films Heterostructures, and Devices
9,828,695	Planar Nonpolar Group-III Nitride Films Grown On Miscut Substrates
9,859,464	Textured Phosphor Conversaion Layer Light Emitting Diode
9,917,422	Semi-Polar III-Nitride Optoelectronic Devices on M-Plane Substrates with Miscuts Less than +/-15 Degrees in the C-Direction
9,951,912	Tunable White Light Based on Polarization Sensitive Light-Emitting Diodes
10,186,835	Monolithic Integraton of Optically Pumped III-nitride Devices
10,217,916	Transparent Light Emitting Diodes
10,446,714	Highly Efficient Gallim Nitride Based Light Emitting Diodes Via Surface Roughening
10,495,268	High Intensity Solid State White Emitter Which Is laser Driven and Uses Single Crystal, Ceramic or Polycrystalline Phosphor
10,454,010	Transparent light emitting diodes
10,529,892	Technique for the growth and fabrication of semipolar (Ga,Al,In,B) n thin films, heterostructures and devices
10,593,854	Transparent light emitting device with light emitting diodes
10,644,213	Transparent light emitting diodes
10,658,557	Transparent light emitting diodes with light emitting diodes
10,685,835	III-nitride tunnel junction with modified P-N interface
10,985,293	Highly efficient gallium nitride based light emitting diodes via surface roughening
10,985,285	Methods for fabricating III-nitride tunnel junction devices
11,164,997	III-nitride tunnel junction light emitting diode with wall plug efficiency of over seventy persent
11,217,722	Hybrid growth method for III-nitride tunnel junction devices
11,348,908	Contact architectures for tunnel junction devices

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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
EP1869707	Technique for the growth of planar semi-polar gallium nitride
EP1697983	Highly Efficient Gallium Nitride Based Light Emitting Diodes Via Surface Roughening
EP2087563	Textured phosphor conversion layer light
EP2320482	emitting diode
EP2633103	2320482 Hightly Efficient Gallium Nitride Based Light Emitting Diodes via Surface Roughening Ammonothermal Growth Of Group-III Nitride Crystals On Seeds With At Least Two Surfaces Making An Acute, Right Or Obtuse Angle With Each Other

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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

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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成長方法

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保護膜を形成する方法

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 4486506	Growth of reduced dislocation density non-polar gallium nitride by hydrid vapor phase epitaxy
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
JP 5010597	Method for growing group III-nitride crystals in supercritical ammonia and its source material
JP 5043835	(Al,Ga,In)N and ZnO direct wafer bonding structure for optoelectronic applications and its fabrication method
JP 5270348	Method for enhancing growth of semipolar (Al,In,Ga,B)N via metalorganic chemical vapor deposition
JP 5363996	AlxGal-x-N-Cladding-Free nonpolar GaN-based laser diodes and LED's
JP 5379973	Technique for the fabrication of nonpolar InGaN thin films, heterostructures, and devices by metalorganic chemical vapor deposition
JP 5645887	Method for enhancing growth of semipolar (Al,In,Ga,B)N via metalorganic chemical vapor deposition
JP 5684455	Method for conductivity control of semipolar (Al,In,Ga,B)N
JP 5702165	Technique for the highly efficient gallium nitride based LED via surface roughening
JP 5706601	Technique for the growth of planar semi-polar gallium nitride
JP 5719493	Technique for the highly efficient gallium nitride based LED via surface roughening
JP 5743127	Technique for the growth and fabrication of semipolar (Ga,Al,In,B) N thin films, heterostructures, and devices
JP 5252465	Growth Of Planar, Non-Polar A-Plane Gallium Nitride By Hydride Vapor Phase Epitaxy
JP 5301988	Packaging Technique For The Fabrication Of Polarized Light Emitting Diodes
JP 5372766	High Light Extraction Efficiency Sphere Led
JP 5461773	Growth Of Planar Reduced Dislocation Density M-Plane Gallium Nitride By Dydride Vapor Phase Epitaxy
JP 5739824	Devices Grown On Nonpolar Or Semipolar (Ga,Al,In,B)N Substrates
JP 5751513	Gallium Nitride Bulk Crystals And Their Growth Method
JP 5774476	Method Of Creating A Hexagonal Wurtzite Single Crystal And Hexagonal Wurtzite Single Crystal Substrate
JP 5838523	Method For Improved Growth Of Semipolar (Al,In,Ga,B)N
JP 5896442	Method For Improved Growth Of Semipolar (Al,In,Ga,B)N
JP 5972798	Semi-Polar III-Nitride Optoelectronic Devices On M-Plane Substrates With Miscuts Less Than +/-15 Degrees In The C-Direction

CHINA PATENTS

CH10052110C	Technique for the highly efficient gallium nitride based LED via surface roughening
CH20060076945	Technique for the growth of planar semi-polar gallium nitride
CH0980128483	(Al,Ga,In)N diode laser fabricated at reduced temperature
CHZL200910142642.4	Technique for the highly efficient gallium nitride based LED via surface roughening
CHZL08801177887	High Light Extraction Efficiency Nitride Based Light Emitting Diode By Surface Roughening
CN20118012048	Semi-polar iii-nitride optoelectronic devices on m-plane substrates with miscuts less than +/-15 degrees in the c-direction
ZL2017102159779	Semi-polar III-nitride optoelectronic devices on M-plane substrates with miscuts less than +/-15 degree in the C- direction

FRANCE PATENTS

FR1697983	Technique for the highly efficient gallium nitride based LED via surface roughening
FR1869707	Technique for the growth of planar semi-polar gallium nitride
FR2087563	Textured phosphor conversion layer light emitting diode
FR2633103	Ammonothermal Growth Of Group-III Nitride Crystals On Seeds With At Least Two Surfaces Making An Acute, Right Or Obtuse Angle With Each Other

GERMANY PATENTS

GR60341314.5	Technique for the highly efficient gallium nitride based LEF via surface roughening
GR60200603012	Technique for the growth of planar semi-polar gallium nitride
GR2087563	Textured phosphor conversion layer light emitting diode
GR20070386977	Textured phosphor conversion layer light emitting diode
GR2633103	Ammonothermal growth of group-III nitride crystals on seeds with at least two surfaces making an acute, right or obtuse angle with each other
60 2011 064 933.7	Semi-polar III-nitride optoelectronic devices on M-plane substrates with miscuts less than +/-15 degree in the C- direction

HONG KONG PATENTS

HK1112109	Technique for the growth of planar semi-polar gallium nitride

ITALY PATENTS

IT1697983	Technique for the highly efficient gallium nitride based LED via surface roughening
IT2087563	Textured phosphor conversion layer light emitting diode
IT2633103	Ammonothermal Growth Of Group-III Nitride Crystals On Seeds With At Least Two Surfaces Making An Acute, Right Or Obtuse Angle With Each Other

NETHERLANDS PATENTS

N1697983	Technique for the highly efficient gallium nitride based LEF via surface roughening
N2087563	Textured phosphor conversion layer light emitting diode
N2633103	Ammonothermal Growth Of Group-III Nitride Crystals Onseeds With At Least Two Surfaces Making An Acute, Right Or Obtuse Angle With Each Other

REPUBLIC OF KOREA PATENTS

ROK10-1086155	Technique for the growth of planar, non-polar A-plane gallium nitride by hydride vapor phase epitaxy
ROK1145755	Technique for the growth of planar semi-polar gallium nitride
ROK1145753	Technique for the growth of planar semi-polar gallium nitride
ROK1154494	Technique for the highly efficient gallium nitride based LED via surface roughening
ROK1156146	Technique for the highly efficient gallium nitride based LED via surface roughening
ROK10-1167590	Non-polar A-plane gallium nitride thin films grown by metalorganic chemical vapor
ROK10-1288489	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
ROK10-1317469	Non-polar (Al,B,In,Ga)N quantum well and heterostructure materials and devices
ROK10-1372698	Growth of Planar, Non-polar A-Plane Gallium Nitride by Hydride Vapor Phase Epitaxy
ROK1347848	Method for enhancing growth of semipolar (Al,In,Ga,B)N via metalorganic chemical vapor deposition
ROK1351396	Technique for the growth and fabrication of semipolar (Ga,Al,In,B)N thin films, heterostructures, and devices
ROK1365604	Technique for the fabrication of nonpolar InGaN thin films, heterostructures, and devices by metalorganic chemical vapor deposition
ROK1416838	Method for conductivity control of semipolar (Al,In,Ga,B)N
ROK1510461	Method for improved growth of semipolar (Al,In,Ga,B)N
ROK1515058	Planar nonpolar M-plane group III-Nitride films grown on miscut substrates
ROK101251443	Growth Of Planar Reduced Dislocation Density M-Plane Gallium Nitride By Dydride Vapor Phase Epitaxy
ROK1499203	Growth Of Planar, Non-Polar A-Plane Gallium Nitride By Hydride Vapor Phase
ROK10-1537300	Epitaxy
ROK10-1623422	Growth Of Planar Non-Polar {1-1 00} M-Plane Gallium Nitride With Metalorganic
ROK1668385	Chemical Vapro Deposition(Mocvd)
ROK1810613	Method of Creating a Hexagonal Wurtzite Single Crystal and Hexagonal Wurtzite Single Crystal Substrate
	Method of Creating a Hexagonal Wurtzite Single Crystal and Hexagonal Wurtzite Single Crystal Substrate
10-2085919	Semipolar {20-21} III-nitride laser diodes with etched mirrors

TAIWAN PATIENTS

TI453813	
T1366865	Planar Nonpolar M-Plane Group III-Nitride Films Grown On Miscut Substrates
TI369784	Optical Designs For High-Efficacy White-Light Emitting Diodes
TI377602	Method Of Creating A Hexagonal Wurtzite Single Crystal And Hexagonal Wurtzite Single Crystal Substrate
TI402217	Technique for the growth of planar semi-polar gallium nitride
TI404122	Growth of reduced dislocation density non-polar gallium nitride by hydride vapor phase epitaxy
TI446569	Technique for the growth of planar, non-polar A-place gallium nitride by hydride vapor phase epitaxy
TI452726	Growth of planar non-polar {1-100} M-plane GaN with metalorganic chemical vapor deposition (MOCVD)
TI455181	Method for growing group III-nitride crystals in supercritical ammonia and its source material
TI460881	Method for enhancing growth of semipolar (Al,In,Ga,B)N via metalorganic chemical vapor deposition
TI469186	Standing transparent mirror-less (STML) light emitting diode
TI480435	High light extraction efficiency nitride based light emitting diode Technique for the growth and fabrication of semipolar (Ga,Al,In,B)N thin films, heterostructures, and devices
TI390633	Transparent LEDS
TI397199	Planar non-polar M-plane group III-nitride films grown on miscut substrates
TI433313	Gallium nitride bulk crystals and their growth method
TI445054	Lateral Growth Method For Defect Reduction Of Semipolar Nitride Films Packaging Technique For The Fabrication Of Polarized Light Emitting Diodes Growth Of Planar, Non-Polar A-Plane Gallium Nitride By Hydride Vapor Phase Epitaxy
TI492411	Growth Of Reduced Dislocation Density Non-Polar Gallium Nitride By Hybrid Vapor Phase Epitaxy
TI490918	Non-Polar And Semi-Polar Light Emitting Devices
TI518941	Method For Improved Growth Of Semipolar (Al,In,Ga,B)N
TI560963	Standing Transparent Mirrorless Light Emitting Diode
TI604512	Semi-polar iii-nitride optoelectronic devices on m-plane substrates with miscuts less than +/-15 degrees in the c-direction Planar non-polar M-plane group III-nitride films grown on miscut substrates
I633679	Standing transparent mirrorless light emitting diode

UNITED KINGDOM PATIENTS

UK1697983	Technique for the highly efficient gallium nitride based LED via surface roughening
UK1869707	Technique for the growth of planar semi-polar gallium nitride
UK2087563	Textured phosphor conversion layer light emitting diode
UK2633103	Ammonothermal Growth Of Group-III Nitride Crystals On Seeds With At Least Two Surfaces Making An Acute, Right Or Obtuse Angle With Each Other
2543119	Semi-polar III-nitride optoelectronic devices on M-plane substrates with miscuts less than +/-15 degree in the C- direction