

THEODORE D. MOUSTAKAS



Dr. Moustakas is the inaugural Distinguished Professor of Photonics and Optoelectronics at Boston University. He received his PhD from Columbia University in 1974. He held research positions at Harvard University and Exxon Corporate Research Laboratory prior to joining Boston University in 1987 as a Professor of Electrical and Computer Engineering. He is also a Professor of Physics and Associate Head of the Division of Materials Science and Engineering.

Dr. Moustakas' research contributions cover a broad spectrum of topics in opto-electronic materials and devices, including nitride semiconductors, amorphous semiconductors, III-V compounds, diamond thin films and metallic multi-layers. He is the co-editor of eight books, including *Gallium Nitride I* (Academic Press, 1998) and *Gallium Nitride II* (academic Press, 1999), the author of chapters in eight books and 340 papers in technical journals and conference proceedings (Google citations 11,550, h index 52). He served as a special editor of the *Journal of Vacuum Science and Technology* and of the *Journal of Electronic Materials*. He presented 140 invited and plenary talks in national and international conferences. He has been granted 31 U.S. patents and several are pending in the fields of nitride semiconductors, amorphous silicon and diamond materials. Intellectual property that resulted from his work has been licensed to a number of companies, including major manufacturers and users of blue LEDs and lasers (Cree, Nichia, Philips, OSRAM, Apple, Google, Amazon, Samsung, LG, Sony etc.).

Dr. Moustakas is a Fellow of the American Physical Society (1994), the Electrochemical Society (1997), the Institute of Electrical and Electronic Engineers-IEEE (2014), and a Charter Fellow of the National Academy of Inventors (2012). He holds an honorary doctoral degree from the Aristotle University (2003); he received the MBE Innovator Award in 2010; in 2011 he received the Distinguished Scholar Award from the BU College of Engineering and in 2013 he received the Boston University Innovator of the Year Award.

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Education

- Ph.D. (Solid State Science and Engineering) 1974 - Columbia University
- M.Ph. (Solid State Science and Engineering) 1974 – Columbia University
- B.S. (Physics) 1964 - Aristotle University, Thessaloniki, Greece

Career History

- Boston University, Professor of Electrical Engineering (1987-Present)
- Boston University, Professor of Physics (1991-Present)
- Boston University, Faculty Member of the Center for Photonics Research (1994-Present)
- Boston University, Associate Head of the Materials Science and Engineering Division -2008-Present
- Exxon Corporate Research Laboratories, Senior Research Scientist (1977-1987)
- Harvard University, Research Fellow (1974-1977)
- Columbia University / IBM T. J. Watson Laboratory, Research Assistant (1969-1974)
- Theagenion Anti-Cancer Institute (Thessaloniki, Greece) Radiophysicist (1966-1968)

Visiting Positions

- Massachusetts Institute of Technology (September 2001- June 2002)
- Aristotle University, Thessaloniki, Greece (Nov. 1999, May 2001, June 2003)
- Indian Association for the Cultivation of Science, Calcutta, India (Summer 1989)
- Princeton University (Presented a series of lectures on Amorphous Semiconductors, Spring 1985)

Research Interests

- III- Nitrides Semiconductors (Optoelectronic and electronic devices}
- Molecular Beam Epitaxy of Nitride Semiconductors and other III-V compounds
- Hydride Vapor Epitaxy (HVPE) of Nitride Semiconductors.
- Diamond Thin Films
- Amorphous Semiconductors {Amorphous Si solar cells, and Chalcogenide glasses}
- Metallic Multi-layers {Ceramic /Transition Metals}

Fellowships and Awards

- In 2014 he was named the BU inaugural **Distinguished Professor of Photonics and Optoelectronics**
- In 2014 he was elected **Fellow of IEEE**
- In 2013 he was awarded the ***Boston University Innovator of the Year Award***.
- In 2012 he was elected **Charter Fellow of the National Academy of Inventors**
- In 2011 he was awarded the **Distinguished Scholar Award** from the BU College of Engineering
- In 2010 he was awarded the **MBE Innovator Award**
- His work is cited in the 2006 edition of ***Technology Transfer Works: 100 Cases from Research to Realization***, [Better World Project](http://www.betterworldproject.net) (www.betterworldproject.net).
- In 2003 he was awarded an honorary degree “**Doctor Honoris Causa**” from the Aristotle University
- In 1997 he was elected **Fellow of the Electrochemical Society**
- In 1994 he was elected **Fellow of the American Physical Society**
- In 1997-98 he was awarded the BU ECE Faculty Award for Excellence in teaching
- In 1994-1995 he was a finalist for the Boston University Metcalf Award for Excellence in Teaching
- In 1989 he was appointed Technical Advisor to United Nations Industrial Development Organization
- In 1975-1976 he received the IBM Post-Doctoral Fellowship at Harvard University
- In 1971-1974 he received the IBM Doctoral Fellowship at Columbia University
- In 1969-1971 he received the Campbell Fellowship at Columbia University

- In 1958-1962 he received the Greek National Scholarship at Aristotle University

Activities in Professional Societies

- **American Physical Society**
 - Co-Chairman of the Symposium on "Wide Band-gap Semiconductors for Blue-UV Emitters" (St. Louis, March 1996)
 - Co-Chairman of the Symposium on "Wide Band-gap Semiconductors" (Centennial Meeting in Atlanta, March 1999).
- **Material Research Society**
 - Chairman of the 1991 Symposium on "Wide Band-gap Semiconductors"
 - Chairman of the 1996 Symposium on "III-V Nitrides"
- **The Electrochemical Society**
 - Chairman of the Workshop "III-V Nitrides Materials and Processes I" (Los Angeles, May 1996)
 - Chairman of the Workshop "III-V Nitrides Materials and Processes III" (Boston, November 1998)
 - Member of the governing body of the Dielectric Science and Technology Division
 - Member of the Honors and Awards Committee (Chairman of the Subcommittee for the Solid State Science and Technology Award)
 - Member of the Nominations Committee 1997
- **Elected to Electronic Materials Committee(1993-1999)**
 - Organization of Annual Electronic Materials Conference
 - Publication of Journal of Electronic Materials
- **North American Committee on Molecular Beam Epitaxy (2001-2011)**
 - Member of the advisory Board

Conference Organization

- Organization Committee for the "5th Gordon Conference on Plasma Chemistry" (Andover, N.H., 1978)
- Organization Committee for the Symposium "Material Processes and Characterization Techniques for Solar Energy Devices" of 155th Electrochemical Society Meeting (Boston, 1979)
- Program Chairman for the Symposium of the American Vacuum Society on "Coatings for Large-scale Metallurgical, Optical and Electronic Applications" (Clinton, N.J., 1984)
- Program Chairman for the Symposium of the American Vacuum Society on "Strained Layer Superlattices" (Clinton, N.J., 1986)
- Organization Committee for the "2nd International Workshop on the Physics and Applications of Amorphous Semiconductors" (Torino, Italy, 1988)
- Organization Committee for the 1st International Symposium on "Diamond and Diamond-like Films." of the 175th Electrochemical Society Meeting (Los Angeles, 1989)
- Organization Committee for the 2nd International Symposium on "Diamond and Diamond-like Film" The Electrochemical Society Meeting (Washington, D.C., 1991)
- Program Chairman for the MRS Symposium "Wide Band-gap Semiconductors" (Boston, 1991)
- Organization Committee for "Workshop on Wide gap Nitrides" (St. Louis, Missouri, 1992)
- International Advisory Committee of the "Third International Conference on Electrical Transport and Optical Properties of Inhomogeneous Media" (Guanajuato, Mexico, 1993)
- Organization Committee of the 36th Electronic Materials Conference (Boulder, Co., June 1994)
- Organization Committee for the Second Workshop on Wide Band-gap Nitrides (St. Louis, Missouri, October 1994)

- Organization Committee for the 37th Electronic Materials Conference (University of Virginia, June 1995)
- International Advisory Committee of the 6th International Conference on Silicon Carbide and Related Materials (Kyoto, Japan, September 1995)
- Organization Committee of the Topical Workshop on III-V Nitrides (Nagoya, Japan, 1995)
- Organization Committee of the SPIE International Symposium on "Wide Band-gap Semiconductors: Lasers, LEDs and High Temperature Devices." (San Jose, California, January 1996).
- International Advisory Committee of the "International Symposium on Blue Lasers and Light-emitting Diodes" (Chiba University, Japan, March 1996)
- Organization Committee for the "3rd Workshop on Wide Band-gap Nitrides" (St. Louis, Missouri, March 1996)
- Co-Chairman for the American Physical Society Meeting Symposium on "Wide Band-gap Semiconductors for Blue-UV emitters" (St. Louis, March 1996).
- Program Chairman of the Electrochemical Society Workshop on "III-V Nitride Materials and Processes" (Los Angeles, May 1996)
- Organization Committee for the 38th Electronic Materials Conference (University of California at Santa Barbara, June 1996)
- Program Chairman for the MRS Symposium "III-V Nitrides," (Boston, December 1996)
- Organization Committee for the 39th Electronic Materials Conference (Ft. Collins, Co., June 1997)
- Organization Committee for the III-V Nitride Materials and Processes Symposium, 192nd Meeting of the Electrochemical Society (Paris, France, Aug.1997)
- International Advisory Committee for the Second International Conference on Nitride Semiconductors (Tokushima, Japan, Oct. 1997)
- Program Committee for the IEEE Topical Meeting "Gallium Nitride Materials, Processing and Devices," (Montreal, Quebec, August 1997)
- International Advisory Committee for the 3rd European Workshop on GaN (Warsaw, Poland, June 1998)
- Organization Committee for the 40th Electronics Materials Conference (Charlottesville, Virginia, June 1998)
- Program Committee of the "Second International Symposium on Blue Lasers and Light-emitting Diodes" (Chiba University, Japan, September 1998)
- Program Chairman for the 194th Electrochemical Society Meeting Workshop on III-V Nitride Materials and Processes (Boston, November 1998).
- Co-chairman for the American Physical Society Meeting Symposium on "Wide band Gap semiconductors" (Atlanta, March 1999).
- Organizing Committee for the 41st Electronics Materials Conference (Santa Barbara, California, June 1999)
- Organizing Committee for the 6th GaN Workshop (Richmond, VA, March 2000)
- International Advisory Committee for the 4th European Workshop on GaN (Nottingham- U.K, July 2000)
- International Advisory Committee for the "International Workshop on Nitride Semiconductors" (Nagoya, Japan, Sept. 2000)
- Program Committee for the 11th International Conference on Molecular Beam Epitaxy (Beijing, China, September 2000)
- Member of the organizing committee of The Fourth International Conference on Nitride Semiconductors (Denver, Colorado, July 2001)
- Conference Committee, SPIE meeting on "Gallium-Nitride-based Technologies" (San Jose, January 21-22, 2002)

- Organizing Committee for the 7th Wide Bandgap III-Nitride Workshop (Richmond, VA, March 2002).
- Organizing Committee for the Symposium “Wide Bandgap Semiconductors for Photonic and Electronic Devices and Sensors”, 201st Electrochemical Society Centennial Meeting (Philadelphia May 2002).
- International Advisory Committee of the 5th International Conference on Nitride Semiconductors (Chiba, Japan, July 2003).
- International Advisory Board of the “International Conference on Electro-ceramics” (MIT, Cambridge, MA, August 2003).
- Member of the Advisory Board of the 21st North America Molecular Beam Epitaxy Conference (Keystone, Colorado, September 2003)
- Organizing Committee for the Symposium “Wide Bandgap Semiconductors for Photonic and Electronic Devices and Sensors”, of the 2004 Joint International Electrochemical Society Meeting (Honolulu, Hawaii, September 2004).
- Member of the Advisory Board of the 22nd North America Molecular Beam Epitaxy Conference (Banff, Alberta, Canada, October 2004)
- International Advisory Committee of the 6th International Conference on Nitride Semiconductors (Bremen, Germany, August 2005).
- Member of the Advisory Board of the 23rd North America Molecular Beam Epitaxy Conference (Santa Barbara, California, September 2005)
- Member of the Program Committee of the International Molecular Beam Epitaxy Meeting (MBE-2006). (Tokyo, Japan, September, 2006)
- Member of the Advisory Board of the 24th North America Molecular Beam Epitaxy Conference (Duke University, Oct. 8, 2006)
- Member of the Program Committee of the International Workshop on Nitride Semiconductors-2006 (Kyoto, Japan, Oct. 22, 2006)
- Member of the International Advisory Committee of the 7th International Conference on Nitride Semiconductors (ICNS-2007) (Las Vegas, Sept. 16-21, 2007)
- Member of the Advisory Board of the 25th North America Molecular Beam Epitaxy Conference (NAMBE-2007) (University of New Mexico, Albuquerque, New Mexico, Sept 23-26, 2007)
- Member of the Program Committee of the 15th International Conference on Molecular Beam Epitaxy, (University of British Columbia, Vancouver, Canada, August 3-8, 2008)
- Member of the Advisory Board and Program Committee of the 26th North America Molecular Beam Epitaxy Conference (NAMBE-2009) (Princeton University August 9-12, 2009)
- Member of the International Advisory Committee of the 8th International Conference on Nitride Semiconductors (ICNS-8) (South Korea, Oct. 19-23, 2009)
- Member of the International Scientific Committee of the 7th International Conference on Nanoscience and Nanotechnologies (NN10) (Ouranopolis Halkidiki, Greece, July 11-14, 2010)
- Member of the Advisory Board and Program Committee of the 27th North America Molecular Beam Epitaxy Conference (NAMBE-2010) (Breckenridge, Colorado, September 26-29, 2010)
- Member of the International Advisory Committee of the 9th International Conference on Nitride Semiconductors (ICNS-9) (Glasgow, Scotland, July 10-15, 2011)
- Member of the Advisory Board of the 28th North America Molecular Beam Epitaxy Conference (NAMBE-2011) (San Diego California, August 14-17, 2011)
- Member of the International Advisory Committee of the 10th International Conference on Nitride Semiconductors (ICNS-10) (Washington DC, USA, August 25-30, 2013)
- Member of the Program Committee of the International Workshop on Nitride Semiconductors (IWN 2014), Wroclaw, Poland, August 24-29, 2014)

Patents

A. Amorphous Silicon and Amorphous Silicon Solar Cells

1. T. D. Moustakas, R. Friedman and C. R. Wronski "**Gradient Doping in Amorphous Silicon**", *US. Patent 4,251,289*, (February 17, 1981).
2. T. D. Moustakas "**Plasma Etching of Amorphous Silicon**", *US. Patent 4,285,762*, (August 25, 1981).
3. T. D. Moustakas, D. L. Morel and B. Abeles "**Hybrid Method of Making an Amorphous Silicon P-I-N Semiconductor Device**", *US-Patent 4,407, 710* (November 22, 1983).
4. T. D. Moustakas and R. Friedman. "**Sputtered P-I-N Amorphous Silicon Semiconductor Device and Method Thereof**", *US. Patent 4,417,092*, (November 22, 1983).
5. T. D. Moustakas and H.P. Maruska "**Method for Sputtering a P-I-N Microcrystalline/ Amorphous Silicon Semiconductor Device with the p- and n-layers sputtered from Boron and Phosphorous Heavily Doped Targets**", *US. Patent 4,508,609* (April 2, 1985).
6. T. D. Moustakas and H. P. Maruska "**Method for Sputtering a P-I-N Amorphous Silicon Semiconductor Devices Having Partially Crystallized p- and n-layers**", *US. Patent 4,528,082* (July 9, 1985).
7. T. D. Moustakas "**Control of the Hydrogen Bonding in Reactively Sputtered Amorphous Silicon**", *US. Patent 4,533,450* (August 6, 1985).
8. H.P. Maruska, M.C. Hicks and T. D. Moustakas "**Optical Detector and Amplifier Based on Tandem Semiconductor Devices**", *US. Patent 4, 739,383* (1988).

B. Hard Materials

9. T. D. Moustakas "**A Composition of Matter that is Hard and Tough**", *US. Patent No.4,804,583* (February 14, 1989).
10. T. D. Moustakas "**Defect-Induced Control of the Structure of Boron Nitride**", *US. Patent No. 5,296,119* (March 22, 1994).

C. III-Nitride Semiconductors (US Patents Issued)

11. T. D. Moustakas "**A Method for the Preparation and Doping of highly insulating monocrystalline Gallium Nitride Thin Films**", US. Patent No. 5,385,862 (January 31, 1995).
12. T. D. Moustakas "**Highly Insulating monocrystalline Gallium Nitride Thin Films**", US Patent No. 5,686,738 (Nov. 11, 1997).
13. T.D. Moustakas and R.J. Molnar "**Method for Epitaxially Growing Gallium Nitride Layers**", US. Patent No. 5,633, 192 (May 27, 1997).
14. T. D. Moustakas and M. Misra "**Photodetectors Using III-V Nitrides**", US. Patent No.5,677,538 (October 14, 1997)
15. T. D. Moustakas and R.J. Molnar "**Device and Method for Epitaxially Growing Gallium Nitride Layers**", US. Patent No.5, 725,674 (March 10, 1998).
16. T. D. Moustakas "**Photodetectors using III-V Nitrides**", US. Patent No. 5,847,397 (Dec. 8,1998)
17. T.D. Moustakas "**Method for the preparation and doping of highly insulating monocrystalline gallium nitride thin films**", US Patent No. 6,123,768 (Sept. 26, 2000)
18. D. Doppalapudi, T.D. Moustakas, R. Mlcak and H.L. Tuller "**Semiconductor Piezoresistor**", US Patent 6,275,137 B1 (August 14, 2001).
19. D. Doppalapudi, T.D. Moustakas, R. Mlcak and H.L. Tuller "**Semiconductor Piezoresistor**", US Patent 6,441,716 (August 27, 2002).
20. Theodore D. Moustakas, "**Method of Making a Semiconductor Device with Exposure of Sapphire Substrate to Activated Nitrogen**" U.S. Patent 6,953,703 B2 (Oct. 11, 2005).
21. Theodore D. Moustakas, "**Semiconductor Device having Group-III Nitride Buffer Layer and Growth Layers**", U.S. Patent No: 7,235,819 (June 26, 2007).
22. Liberty L. Gunter, Kanin Chu, Charles R Eddy Jr., Theodore D Moustakas, Enrico Bellotti, "**GaN-based Permeable-Base Transistor and method of fabrication**", US Patent No: US 7,413,958B2 (August 19,2008)
23. Theodore D. Moustakas, "**Semiconductor Device having Group-III Nitride Buffer Layer and Growth Layers**", U.S. Patent No: 7,663,157 (February 16, 2010).
24. Theodore D. Moustakas, Jasper S. Cabalu, "**Optical Devices featuring textured semiconductor layers**" U. S. Patent No: 7,777,241 B2 (Issue date: August 17, 2010)
25. Theodore D. Moustakas and Jasper Cabalu, "**Optical Devices Featuring Textured Semiconductor Layers**" U. S. Patent No. 8,035,113 B2 (Issue date: October 11, 2011)
26. Liberty L. Gunter, Kanin Chu, Charles R Eddy Jr., Theodore D. Moustakas, Enrico Bellotti, "**GaN-based Permeable-Base Transistor and method of fabrication**", US Patent No: RE42,955E (Issue Date: November 22, 2011)
27. Theodore D. Moustakas and Jasper Cabalu, "**Optical Devices Featuring Textured Semiconductor Layers**" U. S. Patent No. 8,237,175 B2 (Issue Date: August 7, 2012)

28. Liberty L. Gunter, Kanin Chu, Charles R Eddy Jr., Theodore D. Moustakas, Enrico Bellotti, **“GaN-based Permeable-Base Transistor and method of fabrication”**, US Patent No: 8,247,843 (Issue Date: August 21, 2012)
29. Theodore D. Moustakas and Adrian Williams, **“Planarization of GaN by Photoresist Technique using an Inductively Coupled Plasma”** US Patent No. 8,257,987 (Issue Date: Sept. 4, 2012)
30. Theodore D. Moustakas, Adam Moldawer, Anirban Bhattacharyya, Joshua Abell, **“Optical Devices Featuring Non-polar Textured Semiconductor Layers”** U. S. Patent No. 8,592,800 (Issue Date: Nov. 26, 2013)
31. Yitao Liao and Theodore D. Moustakas, **“Ultraviolet Light Emitting Diode structure and Method of Manufacturing the same”** U. S. Patent No. 8,723,189 (Issue Date: May 13, 2014)

D. III-Nitride Semiconductors (Patents Issued in other Countries)

32. T.D. Moustakas and Mira Misra **“ Photodetectors Using III-V Nitrides”** Canadian Patent No. 2,226,439 (Issue date: April 10, 2001).
33. Theodore D. Moustakas, **"Highly insulating monocrystalline Gallium Nitride Thin Films"**, Japanese Patent No. 3,817,206 (Issue date: June 16, 2006)
34. Theodore D. Moustakas **“Semiconductor Device Having Highly Insulating Monocrystalline Gallium Nitride Thin Films”** Japanese Patent No. 4,716,526 (Issue date: April 8, 2011)
35. Theodore D. Moustakas and Jasper Cabalu, **“Optical Devices Featuring Textured Semiconductor Layers”** European Patent No. 1,735,838 (Issue date: Sept. 8, 2011)

E. III-Nitride Semiconductors (Patent Applications)

36. T.D. Moustakas **“Improved Retro reflective Sheet Material”**, U.S.S.N 08/017, 188 (February 5, 1993) (Abandoned)
37. H.M. Ng and T.D. Moustakas **“Group III-Nitride VCSELs (Vertical Cavity Surface Emitting Lasers)”**, US Provisional Patent Application No. 60/178,236 (filed Jan 26, 2000) (Abandoned)
38. Harry L. Tuller, Theodore D. Moustakas, Yong K. Min , **“Method for p-type doping of wide band gap oxide Semiconductors”** United States Patent Application 2004/0108505 (June 10, 2004)
39. Theodore D. Moustakas, Jasper S. Cabalu, **“Formation of textured III- Nitride Templates for the Fabrication of Efficient Optical Devices”** US Provisional Application No. 60/562,489 (Filed April 15, 2004)
40. Theodore D. Moustakas, Jasper S. Cabalu, **“Formation of Textured III- Nitride Templates for the Fabrication of Efficient Optical Devices”** US Provisional Application No. 60/615,047 (Filed October 1, 2004)
41. Theodore D. Moustakas, Jasper S. Cabalu, **“Nitride LEDs Based on Flat and “Wrinkled” Quantum Wells”** US Provisional Application No. 60/645,704 (Filed January 21, 2005).

42. Theodore D. Moustakas and Jasper Cabalu, **“Optical Devices Featuring Textured Semiconductor Layers”**, International Patent Application No: PCT /US05/012849 (Filed April 15, 2005). International Publication Number WO 2005/104236 A3 (November 3, 2005).
43. Theodore D. Moustakas and Jasper Cabalu, **“Optical Devices Featuring Textured Semiconductor Layers”**, US Provisional Patent Application No 60/732,034 (Filed 10/31/2005)
44. Theodore D. Moustakas and Jasper Cabalu, **“Optical Devices Featuring Textured Semiconductor Layers”**, International Patent Application No: PCT/US2006/042483 (Filed Oct. 31, 2006). (International Publication Date: 10 May 2007; **International Publication Number WO 2007/053624 A2**)
45. Theodore D. Moustakas and Jasper Cabalu, **“Optical Devices Featuring Textured Semiconductor Layers”** European Patent Application No. 05 744 389.7 (Published on Dec. 27, 2006- **Publication number 1735838**).
46. Theodore D. Moustakas and Adrian Williams, **“Planarization of GaN by Photoresist Technique using an Inductively Coupled Plasma”** US Provisional Application No. 60/648,777 (Filed Feb.1, 2005)
47. Theodore D. Moustakas and Adrian Williams, **“Planarization of GaN by Photoresist Technique using an Inductively Coupled Plasma”** US Provisional Application No. 60/764, 389 (Filed Feb.2, 2006)
48. Theodore D. Moustakas and Adrian Williams, **“Planarization of GaN by Photoresist Technique using an Inductively Coupled Plasma”** US Patent Application No. 60/880, 758 (Filed Jan. 17, 2007)
49. Theodore D. Moustakas and Adrian Williams, **“Planarization of GaN by Photoresist Technique using an Inductively Coupled Plasma”**, PCT International Application No. **PCT/US2007/002943**(Filed Feb. 2, 2007).
60. Theodore D. Moustakas and Adrian Williams, **“Planarization of GaN by Photoresist Technique using an Inductively Coupled Plasma”** US Patent Application No. 12/223,505 (Filed 7/31/ 2008) Publication No: US-2009-0236693-A1 (Publication Date 09/24/2009)
51. Theodore D. Moustakas and Philip Lamarre, **“Methods for growing selective areas on substrates and Devices thereof”**, Provisional Patent Application No. 60/961,829.
52. Theodore D. Moustakas, **“Low-cost blue/UV LEDs with very high photon conversion and extraction Efficiency for white lighting”** U.S. Provisional Patent Application No. 61/068,605
53. Theodore D. Moustakas and Jasper Cabalu, **“Optical Devices Featuring Textured Semiconductor Layers”** European Patent Application No. 06 827,176.6 (Published on August 6, 2008- **Publication number 1952 449**)
54. Theodore D. Moustakas, **"Semiconductor Device Having Highly Insulating Monocrystalline Gallium Nitride Thin Films"**, Japanese Patent Application 2007-24009 (Filed Feb. 2, 2007).
55. Theodore D. Moustakas and Jasper Cabalu, **“Optical Devices Featuring Textured Semiconductor Layers”** Canadian Patent Application No 2, 267, 880
56. Theodore D. Moustakas, Adam Moldawer, Anirban Bhattacharyya, Joshua Abell, **“Optical Devices Featuring Non-polar Textured Semiconductor Layers”** PCT International Application No: PCT/US2009/036554, (International publication number: WO 2009/111790 A1, Publication Date: Sept. 11, 2009)
57. Theodore D. Moustakas, Adam Moldawer, Anirban Bhattacharyya, Joshua Abell, **“Optical Devices Featuring**

- Non-polar Textured Semiconductor Layers**” U. S. Patent Application No. 12/920,391 (Filed 10/21/2010)
58. Yitao Liao and Theodore D. Moustakas, **“Method of growing an AlGa_N layer with band structure Potential fluctuations and manufacturing ultraviolet light emitting devices containing the same”** U.S Provisional Patent Application No. 61/329,947 (Filed April 30, 2010)
 59. Theodore D. Moustakas and Jasper Cabalu, **“Optical Devices Featuring Textured Semiconductor Layers”** U. S. Patent application No. 13/242,700 (Filed 9/23/2011)
 60. Yitao Liao and Theodore D. Moustakas, **“High Efficiency Ultraviolet Light Emitting Diodes with Band Structure Potential Fluctuations”** PCT International Application No: PCT/US2011/034724 (Filed on May 2, 2011). International publication number: WO 2012 / 012010 A8 (publication date: 26 January 2012)
 61. Yitao Liao and Theodore D. Moustakas, **“Ultraviolet Light Emitting Diode structure and Method of Manufacturing the same”** U.S Provisional Patent Application No. 61/583,848 (Filed January 6, 2012)
 62. Theodore D. Moustakas, **“Semiconductor Device Having Highly Insulating Monocrystalline Gallium Nitride Thin Films”** Japanese Patent Application 2012-156705 (Filed July 12, 2012); Japanese Publication No. 2012-248856 (Publication Date: December 12, 2012)
 63. Theodore D. Moustakas and Adrian Williams, **“Planarization of GaN by Photoresist technique using an Inductively Coupled Plasma”** US Patent Application No. 13/ 603, 130 (Filed Sept. 4, 2012)
 64. Yitao Liao and Theodore D. Moustakas, **“High Efficiency Ultraviolet Light Emitting Diodes with Band Structure Potential Fluctuations”**, US Patent Application No. 13/646,038 (Filed 10/5/2012)
 65. Yitao Liao and Theodore D. Moustakas, **“Ultraviolet Light Emitting Diode structure and Method of Manufacturing the same”** US Patent Application No. 13/734,333 (Filed 1/4/2013)
 66. Theodore D. Moustakas and Jasper Cabalu, **“Semiconductor Device, Method for controlling Electroluminescence Spectrum, variable color indicator, Variable color illumination device, Two-Dimensional Color display and projector”**, Japanese Patent Application No. 2008-538970
 67. Yitao Liao and Theodore D. Moustakas, **“Ultraviolet Light Emitting Diode structure and Method of Manufacturing the same”** US Patent Application No. 14/250,914 (Filed 4/11/2014, allowed 11/13/2014))
 68. Gordon C. Brummer, Denis M. Nothorn and T. D. Moustakas, **“High Efficiency Deep UV Light Emitting Diodes”**, U.S Provisional Patent Application No. 62/020119 (Filed 7/2/2014)
 69. Akintunde Akinwande, Theodore Moustakas, Jonah Jacob, and Roberto Paiella **“Micro-Electron Beam Pumped Deep UV Laser”**, U.S Provisional Patent Application No: 62/096,595 (Filed Dec. 24, 2014)
 70. Yitao Liao and Theodore D. Moustakas, **“Ultraviolet Light Emitting Diode structure and Method of Manufacturing the same”** US Patent Application No. 14/626,221 (Filed 2/19/2015)

Books

1. **"Gallium Nitride (GaN) I"** J.I. Pankove and T.D. Moustakas Eds, in Semiconductors and Semimetals, Vol. 50 (Academic Press, 1998)
2. **"Gallium Nitride (GaN) II"** J.I. Pankove and T.D. Moustakas Eds in Semiconductors and Semimetals. Vol. 57 (Academic Press, 1999).
3. **"Wide Band-gap Semiconductors"** T. D. Moustakas, J.I. Pankove and Y. Hamakawa Eds. Mat. Res. Soc. Proc. Vol.242 (MRS Pittsburgh, Pa., 1992).
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40. T.D. Moustakas “**Epitaxial Growth and Properties of GaN by ECR-assisted MBE,**” MRS Meeting *1st International Symposium of Gallium Nitride*, (Boston, December 1995) *Abstracts* p.11.
41. T.D. Moustakas “**InGaN Alloys,**” *3rd Nitride Workshops* (St. Louis, March 13, 1996).
42. T.D. Moustakas “**III-V Nitrides and their Optoelectronic Applications**”, Technical Conference on Telecommunications R & D in Massachusetts (University of Massachusetts at Lowell, March 1996).
43. R. Singh and T.D. Moustakas “**Growth of InGaN Films Produced by Electron Cyclotron Resonance MBE,**” *Electrochemical Society Meeting* (Los Angeles, May 1996).
44. T.D. Moustakas “**Growth of III-V Nitrides by MBE,**” *First European Conference on SiC and Related Materials* (Heraklion, Crete, Greece, October 1996)
45. T.D. Moustakas “**III-V Nitrides and their Applications**”, *N.E Chapter of the American Vacuum Society* (Burlington, Mass., December 1996)
46. T.D. Moustakas “**III-V Nitrides, Epitaxial Growth and Applications,**” *The Electrochemical Society, New England Local Section* (Waltham, Mass., February 1997)
47. T.D. Moustakas “**Material Physics Issues of the Wide-gap Nitrides,**” *American Physical Society* (Kansas City, March 1997)
48. T.D. Moustakas “**MBE Growth and Properties of III-V Nitrides,**” *Symposium at GaN Solid State Devices at Wright Patterson Laboratories* (Dayton, Ohio, September 1997)
49. T.D. Moustakas “**MBE Growth and p-doping Characteristics of III-V Nitrides**”, *Second International Conference on Nitride Semiconductors* (Tokushima, Japan, October 1997)
50. T.D. Moustakas “**The Role of Basic Research in the 21st Century,**” *The Science and Technology Seminar Open to the Public by the Venture Business Laboratory* (Tokushima, Japan, October 1997)
51. T.D. Moustakas “**Growth and Characterization of GaN-based Light Emitters by ECR-MBE,**” *Recent Progress in III-V Nitrides-based Short Wavelength Optical Devices and Materials* (Tokushima, Japan, November 1997)
52. T.D. Moustakas “**Structure and Optoelectronic Properties of AlGaIn and InGaIn Alloys,**” *Materials Research Society* (Boston, December 1997)
53. T.D. Moustakas “**Studies of Doping and Alloying Phenomena in III-V Nitrides,**” *9th Seoul International Symposium on the Physics of Semiconductors and Applications* (Seoul, Korea, Nov. 1998)
54. T.D. Moustakas “**Phase Separation and long range order in InGaIn alloys grown by MBE**”, Centennial American Physical Society Meeting (Atlanta, March 20, 1999) *Bulletin of the American Physical*, p.1607.
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56. T.D. Moustakas “**Epitaxial Growth and Properties of III-V Nitrides**”, *Summer School on Advanced Materials for Industrial Application* (Kavala, Greece, June 20th – 27th, 1999)
57. T.D. Moustakas “**Opto-electronic Applications of III-V Nitrides**”, *Materials Physics School, Aristotle University, Thessaloniki Greece* (Nov. 12 1999).
58. H. M. Ng, T.D. Moustakas “**Group III Nitride VCSELs structures grown by Molecular Beam Epitaxy**”, *Symposium - Physics and Simulation of Optoelectronic Devices, SPIE Photonics West Meeting* (San Jose, Jan 24 2000).

59. M. Misra, E. Iliopoulos, D. Doppalapudi, H.M. Ng, T. D. Moustakas **“Photoconductive Detectors Fabricated on GaN and Al_xGa_{1-x}N Films Grown by Molecular Beam Epitaxy”** 6th GaN Workshop Richmond, VA (March 12, 2000)
60. T.D. Moustakas, M. Misra, and A. Sampath, **“Vertical Transport in n-GaN Films”** 6th GaN Workshop Richmond, VA (March 12, 2000)
61. T.D. Moustakas **“Growth and Device Applications of III-V Nitrides by MBE”**, 5th International Workshop on Expert Evaluation and Control of Compound Semiconductor Materials and Technologies, Heraklion, Crete, Greece (May 21, 2000)
62. T.D. Moustakas **“MBE III-V Nitrides”**, Plenary speaker, 11th International Conference on Molecular Beam Epitaxy, Beijing, China -Plenary Talk (September 10, 2000)
63. T. D. Moustakas **“Ordering in Nitride Alloys”**, 2001 Lawrence Symposium on Critical Issues in Epitaxy, Arizona State University (Jan 3, 2001)
64. T. D. Moustakas, **“Group III-Nitride VCSEL structures grown by MBE and Ordering in AlGa_xN Alloys”**, DARPA UV-Emitters Study Group, Arlington VA, (April 8-11, 2001).
65. T. D. Moustakas **“Growth of Nitrides by MBE”**, Army Research Laboratory, Adelphi (May 3, 2001)
66. T.D. Moustakas, **“Physics of III-V compounds”**, A series of lectures in the Graduate Program “Physics of Materials” of the Aristotle University of Thessaloniki, Greece (June 1-8, 2001).
67. T. D. Moustakas, **“MBE Growth of Wide-Bandgap Nitrides”**, Symposium on Gallium Nitride Based Technologies, Photonics West, San Jose (Jan. 21-22, 2002)
68. T. D. Moustakas, **“A series of lectures on Nitride Semiconductors”**, MIT (Spring 2002)
69. T. D. Moustakas, **“Phase Separation and Long Range Atomic Order in Nitride Alloy”**, 7th Nitride Workshop, Richmond Virginia (March 11-13, 2002)
70. T. D. Moustakas, Yan Shao, T. C. Chen, Sandeep Iyer, N. G. Chu and D. B. Fenner, **“Growth of GaN by Gas-Cluster-Ion-Beam Deposition (GCIB)”**, 7th Nitride Workshop, Richmond Virginia (March 11-13, 2002)
71. T. D. Moustakas, **“III-Nitrides-Growth and Applications”**, Arizona State University (March 25, 2002)
72. T. D. Moustakas, **“VCSEL structures based on III-Nitride Semiconductors”**, MIT Micro photonics Center (April 18, 2002)
73. T.D. Moustakas **“Growth of III-Nitrides by MBE”**, Centennial Meeting of the Electrochemical Society, Philadelphia, (May 12 –17 2002)
74. T. D. Moustakas, A. Bhattacharyya, I. Friel, J. Cabalu and Sandeep Iyer, **“Ultraviolet Resonant Cavity Light Emitting Diodes grown by Molecular Beam Epitaxy on non-polar Gallium Nitride Substrates”** DARPA meeting, Daytona Beach, Florida (May 21st, 2002).
75. E. Iliopoulos and T. D. Moustakas, **“Growth of III-Nitrides by Molecular beam epitaxy”**, National Synchrotron light source users meeting, Brookhaven National Labs (May 22nd 2002).
76. Enrico Bellotti and T.D. Moustakas, **“Design and Fabrication of GaN-based Static Induction Transistor”** Symposium on Static Induction Devices (Tokyo, Japan, May. 2002)
77. T. D. Moustakas, **“III-Nitride Semiconductors and their applications to Optical and Electronic Devices”** XVIII Pan-Hellenic Symposium on Solid State Physics and Materials Science Heraklion, Crete, Greece (Sept. 15-18, 2002).
78. T.D. Moustakas **“Ordering in Ternary Nitride Alloys”** 13th International Conference on Ternary and Multinary Compounds, Paris (Oct. 14-18, 2002)
79. T. D. Moustakas **“Basic and Applied Research and their Benefits to Society”** Presentation upon receiving an Honorary Doctoral Degree from the

Aristotle University of Thessaloniki (June 26, 2003)

80. T.D. Moustakas **“Physics and Technology of Optoelectronic Materials and Devices”** *A series of lectures in the Graduate Program “Physics of Materials” of the Aristotle University of Thessaloniki, Greece (June 23-27, 2003).*
81. T. D. Moustakas **“Optoelectronic Devices based on Nitride Quantum Well Structures”** Aristotle University of Thessaloniki, Greece (June 27, 2003).
82. T. D. Moustakas **“Wide Band Gap Semiconductors: Photonic and Electronic Applications”** International Conference on Electro-ceramics (MIT, August 3-7, 2003).
83. T.D. Moustakas, **“GaN LEDs for Solid State Lighting”**, the Electrochemical Society-New England Section (Northeastern University, March 9, 2004).
84. D. Doppalapudi, R. Milcak, J. Chan, H.L. Tuller, J. Abell, W. Li and T.D. Moustakas, **“Sensors based on SiC-AlN MEMS”** 206th Electrochemical Society Meeting (Honolulu, Hawaii, October 2004)
85. T.D. Moustakas, **“Growth of InN Films by Cluster Beam Epitaxy and RF plasma-assisted MBE”** Indium Nitride Workshop 2, (Kailua-Kona, Hawaii, January 2005).
86. T.D. Moustakas, **“Nitride UV-LEDs based on flat and “wrinkled” quantum wells”**, Photonics West 2005 (San Jose, January, 2005).
87. T. D. Moustakas, **“Low-cost Blue/UV LEDs with very high Photon Conversion and Extraction Efficiency for White Lighting”** 2005 DOE Solid-State Lighting Program Planning Workshop (San Diego, February 2005).
88. T. D. Moustakas, **“ GaN LEDs for Solid State Lighting”**, Saint-Gobain Lighting Community Meeting (Boston June 9, 2005)
89. T.D. Moustakas, **“MBE and HVPE Growth of III-Nitrides”** 16th American Conference on Crystal Growth and Epitaxy (Big Sky, Montana, July 10-15, 2005).
90. T. D. Moustakas, J. S. Cabalu, R. Chandrasekaran, S. Riyopoulos **“High efficiency LEDs based on textured GaN templates with wrinkled quantum wells”**, Optics East (Boston, Oct 25. 2005).
91. T.D. Moustakas **“Physics of Textured III-Nitride Quantum Wells for Applications to LEDs”** International Semiconductor Device Research Symposium (Washington DC, Dec. 7-9, 2005).
92. T. D. Moustakas, **“Low-cost Blue/UV LEDs with very high Photon Conversion and Extraction Efficiency for White Lighting”** 2006 DOE Solid-State Lighting Program Planning Workshop (Orlando, February 1-3, 2006).
93. T. D. Moustakas, **“A New Model Describing the Plasma-Assisted MBE Growth of GaN Thin Films and its Alloys with AlN and InN”**, International Conference on Metallurgical Coatings and Thin Films, (San Diego May 1-5, 2006).
94. T. D. Moustakas , **“Significant achievements in III-nitride semiconductors research in the last fifteen years”**, Plenary Speaker, European Workshop on III-Nitride Materials and Devices-Plenary Talk (Heraklion, Crete, Greece, Sept. 18-20, 2006).
95. T. D. Moustakas, **“A new model describing the plasma-assisted MBE growth of GaN thin films”** International Workshop on Nitride Semiconductors 2006, (Kyoto, Japan, Oct. 22-27, 2006)
96. T. D. Moustakas, **“Nitride Semiconductor LEDs”** New England chapter of IEEE LEOS (Lincoln Laboratories, Jan. 11, 2007)
97. T. D. Moustakas, **“GaN R&D at Boston University with emphasis in Solid State Lighting”** The 10th Annual Boston University Photonics Center Symposium (June 8th, 2007).
98. T. D. Moustakas, **“Origin of the high photoconductive gain in AlGaIn thin films”** SPIE Symposium on “Optoelectronic Devices: Physics,

Fabrication, and Applications IV” (Optics East, Boston Sept. 9-12, 2007)

99. T. D. Moustakas, **“Progress in III-nitride semiconductors research and the influence of Jacques Pankove’s work in the development of this field”** Joint OSA /IEEE-LEOS Denver Seminar Jacques Pankove tribute talk (Boulder, November 8, 2007)
100. T.D. Moustakas, **“Blue-Green LEDs based on III-Nitride quantum wells and quantum dots”**, 3rd International Conference on Micro-Nanoelectronics, Nanotechnology and MEMS (Athens, Greece, November 18-21, 2007).
101. T. D. Moustakas, **“GaN-based Light Emitting Diodes for Solid State Lighting”**, Massachusetts Hydrogen Coalition (Boston, March 19, 2008).
102. T. D. Moustakas, **“GaN-based Light Emitting Diodes for Solid State Lighting and UV Applications”**, Photonics Forum (Boston University, March 24, 2008)
103. T. D. Moustakas, **Materials Issues responsible for the “green gap”**, Roundtable Discussions of the Solid State Lighting R&D Task Structure (U. S. Department of Energy, Washington, DC, Sept.17-18, 2008)
104. T. D. Moustakas, **“GaN-based Light Emitting Diodes for Solid State Lighting and UV Applications”**, New England Chinese Information and Networking Association (Waltham MA, Dec. 10, 1008)
105. E. Bellotti, N. Sucena Almeida, A. Moldawer, T. D. Moustakas, S. Chiaria, F. Bertazzi, E. Furno, M.Goano, G. Ghione, **“Physics-based design of III-Nitride and ZnO LEDs: from material properties to device optimization”**, 17th European Workshop on Heterostructure Technology (HETECH 2008), (Venice, Italy, Nov. 3-5, 2008)
106. T. D. Moustakas, **“Fundamental Issues of UV Materials and Devices”**, ARL Workshop on Nitride Semiconductor Optoelectronics for Logistics in Energy, Health and Safety. (Arlington, VA, May 19th, 2009)
107. T. D. Moustakas **“AlGaIn Quantum Wells Emitting below 250 nm with Internal Quantum Efficiency as high as 50%”** in the 2009 Fall MRS Symposium **“III-Nitride Materials for Sensing, Energy Conversion and Controlled Light-Matter Interaction”** (Boston, Nov. 29, -Dec.3, 2009)
108. R. Paiella, K. Driscoll, Y. Li, Y. Liao, A. Bhattacharyya, C. Thomidis, L. Zhou, D. J. Smith, E. Bellotti, and T. D. Moustakas, **“Intersubband Device Applications of Nitride Quantum Structures”** Photonics West (San Jose CA, Jan 2010)
109. T. D. Moustakas **“Fundamental Issues in Green and UV LEDs”** SEMI New England Forum on High Brightness LEDs. (Teradyne Inc., N. Reading MA, March 10, 2010)
110. Yitao Liao, Christos Thomidis and Theodore D. Moustakas **“Recent Advances of High Efficiency Deep UV-LEDs by plasma-assisted Molecular Beam Epitaxy”** ISSLED 2010 (Beijing China May 17, 2010)
111. David Smith, Lin Zhou and Theodore D. Moustakas, **“Structural Characterization of III-Nitride Heterostructures: Some Recent Studies”** ISSLED 2010 (Beijing China, May 17, 2010)
112. T. D. Moustakas, C. Thomidis, Y. Liao and C-K Kao, **“Nitride based UV Emitters and their Applications”** 7th International Conference on Nanoscience and Nanotechnologies (NN10) (Ouranopolis Halkidiki, Greece, July 11-14, 2010)
113. R. Paiella, K. Driscoll, Y. Li, Y. Liao, A. Bhattacharyya, C. Thomidis, L. Zhou, D. J. Smith, and T. D. Moustakas, **“Intersubband Transitions in GaN-Based Quantum Wells: a New Materials Platform for Infrared Device Applications,”** SPIE Optics and Photonics, San Diego (CA), Aug 2010
114. David J. Smith, Lin Zhou, Martha R. McCartney and T.D. Moustakas **“Structural Characterization of III-Nitride Materials and Devices”** SPIE Optics and Photonics, (San Diego CA, Aug 2010)

115. T. D. Moustakas, **"The Development of Nitride Semiconductors by MBE"** The 2010 MBE Innovator Award Presentation at the 27th North American Molecular Beam Epitaxy Conference (Breckenridge, Colorado, Sept. 26-29, 2010)
116. T. D. Moustakas **"Nitride Semiconductors and Their Applications to Solid State Lighting and water /Air Purification"** The BU College of Engineering Distinguished Scholar Award Presentation (Boston University, March 3, 2011)
117. T. D. Moustakas, **"Experimental Evidence that the Plasma-assisted MBE growth of Nitride Alloys is a liquid Phase Epitaxy Process"**, 219 Electrochemical Society Meeting (Montreal, May 1-5, 2011)
118. T. D. Moustakas, **"Nitride Semiconductors: Why they work in optoelectronic devices"**, 220 Electrochemical Society Meeting (Boston, Oct. 9-14, 2011)
119. R. Paiella, J. Henson, J. DiMaria, E. Dimakis, R. Li, S. Minissale, L. Dal Negro, and T. D. Moustakas, **"Plasmon-Enhanced Near-Green Light Emission from InGaN/GaN Quantum Wells"**, 220 Electrochemical Society Meeting (Boston, Oct. 9-14, 2011)
120. T. D. Moustakas, **"Deep UV LEDs with high IQE based on AlGaIn alloys with strong band structure potential fluctuations"**, Photonics West (January 21-26, 2012)
121. T. D. Moustakas, **"The role of extended defects in the performance of electronic and optoelectronic devices"** Plenary Speaker: International Conference on Extended Defects in Semiconductors (Thessaloniki, Greece, June 24-29, 2012)
122. T. D. Moustakas, **"Nitride Semiconductors and their applications in UV Optoelectronic Devices"** 16th Annual "Future of Light Symposium" (Boston University, November 29, 2012)
123. T.D. Moustakas, **"Materials Issues for Vertical Gallium Nitride Power Devices"**, 224 Electrochemical Society Meeting (San Francisco, Oct. 28-Nov. 1, 2013)
124. T. D. Moustakas, **"Fundamental differences between traditional III-V compounds and Nitride Semiconductors"** International Semiconductor Device Research Symposium (ISDRS 2013), Bethesda, Maryland, Dec.11-13, 2013)
125. T. D. Moustakas, **"Nitride Semiconductors and their applications to Solid State lighting and Water/Air purification"**, Keynote Speaker: International Conference on Universal Village 2014 (UV2014), MIT, Cambridge, June 16-17, 2014.
126. R. Paiella and T. D. Moustakas, **"Terahertz Nitrides Intersubband Optoelectronics"** International Workshop on Nitride Semiconductors (IWN 2014), (Wroclaw, Poland, August 24-29, 2014)
127. T. D. Moustakas, **"Fundamental Differences between Cubic III-V Compounds and Wurtzite Nitride Semiconductors Produced by Molecular Beam Epitaxy"**, Plenary Speaker: 18th International Conference on Molecular Beam Epitaxy (Flagstaff, Arizona, September 7-12, 2014)
128. T. D. Moustakas, **"Fundamental differences between traditional III-V compounds and Nitride Semiconductors: The formation and role of extended defects"** 18th Annual Photonics Center Symposium on Advanced Materials by Design for the 21st Century (Boston University, Dec. 4,2014)
129. T. D. Moustakas, **"Fundamental differences between traditional III-V compounds and Nitride Semiconductors: The formation and role of extended defects"** American Vacuum Society (Boston Chapter), (Lincoln Laboratories, Dec. 4, 2014).
130. T. D. Moustakas, **"Fundamental differences between Nitride Semiconductors and Traditional III-V compounds"** The 11th International Conference on Nitride

Semiconductors (ICNS-11), (Beijing, China, Aug.
30-Sept. 4th, 2015)