Nov 98

# FINAL REPORT

# FIFTH ST. LOUIS WORKSHOP ON WIDE BANDGAP NITRIDES

Submitted to


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# Final report, fifth St. Louis Workshop on Wide Bandgap Nitrides

The fifth St. Louis Workshop in Wide Bandgap Nitrides was held August 4-7, 1998 in St. Louis, MO. The workshop was attended by some 80 researchers from mainly the United States and very topical and bottleneck type problems/issues were discussed. The workshop is unique in its approach in that short presentations on pertinent issues are followed by lengthy discussion. Following a group of somewhat related presentations, an overall discussion period involving the authors of that session and the audience is conducted. The forum provides a plenty of time for discussions of important and unresolved issues as opposed presenting polished and finished results typically presented in standard/conventional meeting. The participants over the years have been and are still supportive of the role the workshop plays for the community. It should be mentioned that this workshop carries the distinction of being the first ever meeting in the field in the world.

In 1992 the first-ever Nitride Workshop, and in October 1994 the second, in March 1996 the third, in October 1997 the fourth one, and in August 1998 the fifth one were convened with great successes, bringing together practitioners and theorists, and those who are in a position to have an impact. Much progress has been made toward realizing many of the concepts presented in the first and the second workshops. The response of participants to the first, second, third and fourth workshops was very enthusiastic, and many inquiries have been received since concerning the fifth workshop. A fifth such workshop held in an open forum will facilitate exchange of knowledge and information about recent developments in equipment, growth methods, growth issues particular to each method including lateral growth and associated spatial migration rates, new theoretical findings, dopant (both n and p type) incorporation and likely approaches to be employed, and potential applications to emitters, detectors and electronic devices. In particular the nitride community is at a turning point with respect to the best suited nitrogen source for vacuum deposition and surfactants to enhance migration rates. A workshop of this kind is ideal for bringing the experts in the field together for a hearty discussion of pivotal issues, such as defects, substrates, dopants, and other issues pertinent to devices for rapid progress to follow.

This report contains the announcement for the workshop, abstracts that have been submitted in addition to the solicited speakers, and the workshop program.

# FIFTH ST. LOUIS WORKSHOP ON WIDE BANDGAP NITRIDES ANNOUNCEMENT

Fifth Wide Bandgap Nitride Semiconductor Workshop
Adams Mark Hotel, St. Louis MO USA
August 4-7, 1998

The Fifth Workshop on Wide Bandgap Nitride Semiconductors will be held at the Adam's Mark Hotel near the famous St. Louis Gateway Arch by the Mississippi River in St. Louis, MO, on August 4-7, 1998. This date was previously selected and announced at the Fourth Workshop in March 1997. As you probably know, this is the location at which the previous four Workshops have been held.

The registration information, including the registration fee and the information on where to send the registration fee will be sent in the very near future.

Commencing with a reception on Tuesday evening, August 4, 1998 at 6:00 PM, the Workshop attendees will be treated to the famed Adam's Mark breakfast, lunch, and dinner, as well as coffee breaks on each of the three conference days, except that lunch will not be provided on Friday, August 7, due to the fact that no technical sessions will be scheduled for Friday afternoon.

In making hotel reservations, be certain to mention that you will be attending the Fifth Workshop on Wide-Bandgap Nitrides with local arrangements by Prof. Hadis Morkoç, Virginia Commonwealth University. The key words that will be used by the hotel reservation personnel are "Wide-Bandgap Nitride Workshop", so please fully identify the workshop by this name. Rates are $115 and $125 for single- and double-occupancy, respectively. The hotel can often be full during the time of this conference. Consequently, it is imperative that you make your reservation early. A limited number of rooms with government rates is also available, however, be certain to mention it at the time you make your hotel reservation. You must present your government ID at the time of registration to qualify for this rate. After July 3, 1998, the block of reserved rooms will be released for sale to the general public. For reservations call TEL: (314) 241-7400, FAX: (314) 241-6618. The Adam's Mark Hotel is located at Fourth and Chestnut Streets, St. Louis, MO 63102, approximately five minutes from Union Station, adjacent to the Gateway Arch.

St. Louis' Lambert International Airport can be easily accessed by air from most cities in the United States and many major cities throughout the world. The airport limousine costs about $10 per person one way and $15 round trip with pick up at Door 13 by the Baggage Claim Area.

We look forward to seeing you in St. Louis in August!

Russell D. Dupuis, Workshop Program Chair (dupuis@mail.utexas.edu, 512 471-0537).

Hadis Morkoç, Workshop Arrangements Chair (hmorkoc@vcu.edu, 804 828-0181).

# *Fifth Wide Bandgap Nitride Semiconductor Workshop Schedule, St. Louis MO, 4-7 August 1998*



| Session | Time | Authors (Presenter's Name in Bold) | Contact e-Mail | Title of Talk |
|---|---|---|---|---|
| | | | | |
| ***TUE 8/4*** | 4-8PM | ***WORKSHOP REGISTRATION OPEN*** | | |
| | | | | |
| **Reception** | 6:00 | ***WORKSHOP WELCOMING RECEPTION — Adam's Mark Hotel (Room ???)*** | | |
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| ***WED 8/5*** | 7:15 | ***CONTINENTAL BREAKFAST*** | | |
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| ***WA-0*** | 8:15 | ***WELCOME AND OPENING REMARKS — Hadis Morkoç, Russell Dupuis*** | | |
| | | | | |
| ***WA-1*** | 8:30 | ***Bulk Substrates and MBE —*** | | |
| **WA 1.1** | 8:45 | M. Suscavage, M. Harris, D. Bliss, P. Yip, S. Q. Wang, D. Schwall, L. Bouthillette, **M. N. Alexander**, J. Bailey, M. Callahan, D. C. Look, D. C. Reynolds, R. L. Jones, and C. W. Litton | alexande@maxwell.rl.plh.af.mil | High Quality Hydrothermal ZnO Crystals |
| **WA-1.2** | 9:00 | **L. J. Schowalter** | schowl@rpi.edu | Bulk AlN Substrate Characterization |
| **WA-1.3** | 9:15 | **J. E. Nause** and G. Agarwal | cermeting@juno.com | Growth of Bulk ZnO Crystals for Wide Bandgap Applications |
| **WA-1.4** | 9:30 | R. Held, S. Seutter, B. E. Ishaug, A. Parkhomovsky, A. M. Dabiran, **P. I. Cohen,** G. Knowak, I. Grzegory, and S. Porowski | cohen@ece.umn.edu | Nitride MBE on Bulk Substrates |
| **WA-1.5** | 9:45 | **C. W. Litton**, D. C. Reynolds, J. Van Nostrand, D. C. Look, R. L. Jones, F Hamandi, H. Tang, W. Kim, A. Salvador, A. Botcharev, M. Yeadon, J. Gibson, D. J. Smith, M. Skowronski, and H. Morkoç | litton@el.wpafb.af.mil | Reactive MBE Growth and Characteriztion of GaN on the Polar Faces of Bulk C-plane ZnO Substrates |
| **WA-1HT** | 10:00 | *Short Presentations & Hot Topic Discussions* | | |
| | | | | |
| | 10:15 | *BREAK* | | |
| | | | | |
| ***WA-2*** | 10:30 | ***Nitride Epitaxy I (MBE and VPE) —*** | | |
| **WA-2.1** | 10:30 | **W. J. Schaff**, M. Murphy, T. Eustis, H. Wu, W. Yeo, O. Ambacher, J. Smart, J. R. Shealy and L. F. Eastman | schaff@iiiv.tn.cornell.edu | MBE Growth of Normal and Inverted 2-dimensional Electron Gases in GaN |
| **WA-2.2** | 10:45 | **H. Morkoç** | hmorkoc@vcu.edu | MBE Growth of Nitride Materials |
| **WA-2.3** | 11:00 | R. Beccard, M. Heuken, **H. Juergensen,** O. Parillaud, M. Ilegems | juer@aixtron.com | Design Issues and Operation of GaN Hydride VPE Systems |
| **WA-2.4** | 11:15 | A. E. Nikolaev, Y. V. Melnik, N. I. Kuznetsov, and **V. A. Dmitriev** | vladimir@tdii.com | Insulating GaN Grown on SiC by HVPE |
| **WA-2.5** | 11:30 | Y. V. Melnik, A. E. Nikolaev, S. I. Stepanov, and **V. A. Dmitriev** | vladimir@tdii.com | Aluminum Nitride Grown by HVPE |
| **WA-2HT** | 11:45 | *Short Presentations & Hot Topic Discussions* | | |
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|---|---|---|---|---|
| | 12:00 | ***LUNCH—Adam's Mark Hotel Room ???*** | | |

# *Fifth Wide Bandgap Nitride Semiconductor Workshop Schedule, St. Louis MO, 4-7 August 1998*



| Session | Time | Authors (Presenter's Name in Bold) | Contact e-Mail | Title of Talk |
|---|---|---|---|---|
| *WP-1* | 1:30 | *Nitride Epitaxy II (MOCVD and MBE) and Materials Processing —* | | |
| **WP-1.1** | 1:30 | D. Doppalapudi, M. Misra, D. Korakakis, E. Iliopoulos, S. N. Basu, K. F. Ludwig, Jr., and **T. D. Moustakas** | tdm@panda.bu.edu | Long-Range Atomic Ordering in InGaAlN Alloys |
| **WP-1.2** | 1:45 | **S. Keller**, S. F. Chichibu, M. S. Minsky, A. C. Abare, L. A. Coldren, U. K. Mishra, and S. P. DenBaars | stacia@ece.ucsb.edu | MOCVD Growth of InGaN/GaN Single and Multi Quantum Wells |
| **WP-1.3** | 2:00 | **M. A. Khan**, J. Yang, and T. W. Weeks, Jr. | asif@engr.sc.edu | MOCVD of III-Nitrides for Optoelectronic and Microelectronic Device Applications |
| **WP-1.4** | 2:15 | **J. R. Shealy** | shealy@anise.ee.cornell.edu | A Single Temperature Process for the Nucleation and Growth of Device Quality AlGaN/GaN Materials |
| **WP-1.5** | 2:30 | **H. P. Gillis**, M. J. Christopher, K. P. Martin, and D. A. Choutov | gillis@chem.ucla.edu | Patterning III-N Semiconductors by Low Energy Electron Enhanced Etching (LE4) |
| **WP-1.6** | 2:45 | **C.R. Eddy**, D. Leonhardt, B. Molnar, V. A. Samamia | ceddy@engc.bu.edu | Issues and Mechanisms in High-Density Plasma Etching of GaN |
| WP-1HT | 3:00 | *Short Presentations & Hot Topic Discussions* | | |
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| | 3:15 | *BREAK* | | |
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| *WP-2* | 3:30 | *Nitride Epitaxy III (Lateral Epitaxial Overgrowth) —* | | |
| **WP-2.1** | 3:30 | **R. Davis**, A. Banks, D. Hanser, E. Carlson, et al. | Robert_Davis@ncsu.edu | Single and Double Lateral Epitaxial Overgrowth of GaN on SiC |
| **WP-2.2** | 3:45 | **S. P. DenBaars,** H. Marchand, J. P. Ibbetson, P. T. Fini, S. Chichibu, S. J. Rosner, S. Keller, J. S. Speck, and U. K. Mishra | denbaars@engineering.ucsb.edu | Lateral Epitaxial Overgrowth (LEO) of Low Defect Density GaN on Sapphire and Si (111) Substrates |
| **WP-2.3** | 4:00 | J. Park. P. A. Grudowski, C. J. Eiting, **R. D. Dupuis**, and Z. Liliental-Weber | dupuis@mail.utexas.edu | Growth and Properties of Lateral Epitaxial Overgrown III-N Materials by Metalorganic Chemical Vapor Deposition |
| **WP-2.4** | 4:15 | **P. Kung**, D. Walker, M. Hamilton, J. Diaz, and M. Razeghi | razeghi@epsilon.ece.nwu.edu | Lateral Epitaxial Overgrowth of GaN Thin Films on Sapphire and Silicon |
| **WP-2.5** | 4:30 | **W. Yang,** S. A. McPherson, Z. Mao, S. McKernan, and C. B. Carter | yang_wei@htc.honeywell.com | Lateral Epitaxial Overgrowth of GaN/AlN on Si |
| **WP-2.6** | 4:45 | **Z. Liliental-Weber**, J. Washburn, J. Park, P. A. Grudowski, C. J. Eiting, and R. D. Dupuis | z_liliental-weber@lbl.gov | TEM Study of Defects in Laterally Overgrown GaN Layers |
| **WP-2.7** | 5:00 | **J. A. Freitas, Jr.**, O. H. Nam, R. F. Davis, G. V. Saparin, and S. K. Obyden | freitas@bloch.nrl.navy.mil | Intrinsic Properties of Lateral Epitaxial Overgrown GaN Layers |
| **WP-2.8** | 5:15 | K. J. Nam, A. Sampath, D. Doppalapudi, H. M. Ng, R. S. Mann, E. Iliopoulos, M. Misra, and **T. D. Moustakas** | tdm@panda.bu.edu | Lateral Epitaxial Overgrowth of GaN on Sapphire by the VPE Method |
| **WP-2.9** | 5:30 | **J. R. Shealy**, J. A. Smart, and E. M. Chumbes | shealy@anise.ee.cornell.edu | Single-Step, Single-Temperature Process for Epitaxial Lateral Overgrowth of GaN on SiC and Sapphire Substrates |
| WP-2HT | 5:45 | *Short Presentations & Hot Topic Discussions* | | |
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| | 7:00 | ***WORKSHOP BUFFET DINNER—Adam's Mark Hotel Room ???*** | | |

# Fifth Wide Bandgap Nitride Semiconductor Workshop Schedule, St. Louis MO, 4-7 August 1998



| Session | Time | Authors (Presenter's Name in Bold) | Contact e-Mail | Title of Talk |
|---|---|---|---|---|
| *THUR 8/6* | 7:15 | *CONTINENTAL BREAKFAST* | | |
| | | | | |
| *TA-1* | 8:15 | *Electronic Properties and Devices —* | | |
| **TA-1.1** | 8:15 | **J. C. Zolper** | zolperj@onr.navy.mil | Overview of US Navy Interest in Wide-Bandgap Semiconductors |
| **TA-1.2** | 8:30 | A. F. Fung, C. Cai, P. P. Ruden, **M. I. Nathan**, M. Y. Chen, B. T. McDermott, and G. J. Sullivan | nathan@ece.umn.edu | Hydrostatic and Uniaxial Stress Dependence of the Channel Conductivity of n-AlGaN/GaN Modulation Doped Structures on Sapphire Substrates |
| **TA-1.3** | 8:45 | **B. T. McDermott,** R. Pittman, M. Chen, and E. Gertner | btmcderm@rsc.rockwell.com | Recent Results on 2DEG Mobilities for AlGaN/GaN Heterostructures |
| **TA-1.4** | 9:00 | **L. F. Eastman** and K. Chu | lfe@iiiv.tn.cornell.edu | Piezoelectric AlGaN/GaN Microwave Power HEMT's |
| **TA-1.5** | 9:15 | **R. Gaska**, A. Ping, I. Adesida, A. Dickens, M. S. Shur, V. Kuksenkov, and H. Temkin | remis@apaoptics.com | High-Frequency, Low-Noise Performance of AlGaN-GaN HFETs on Insulating 4H-SiC at Elevated Temperatures |
| **TA-1.6** | 9:30 | **R. Gaska**, A. Ping, I. Adesida, A. Dickens, and M. S. Shur | remis@apaoptics.com | AlGaN/GaN-based HFETs for Digital Applications |
| TA-1HT | 9:45 | *Short Presentations & Hot Topic Discussions* | | |
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| | 10:00 | *BREAK* | | |
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| *TA-2* | 10:15 | *HFETs and Photodetectors —* | | |
| **TA-2.1** | 10:15 | R. P. Vaudo, V. M. Phanse, **J. M. Redwing**, Z. Z. Bandic, P. M. Bridger, E. C. Piquette, R. A. Beach, and T. C. McGill | jredwing@atmi.com | GaN Epitaxy for High Power Devices |
| **TA-2.2** | 10:30 | **B. J. Thibeault**, Y. F. Wu, B. P. Keller, and U. K. Mishra | thibeault@witech.com | Correlation of Trapping Effect to Microwave Power Performance of AlGaN/GaN HEMTs |
| **TA-2.3** | 10:45 | **D. Grider**, C. Nguyen, N. Nguyen | dgrider@hrl.com | GaN MODFET Microwave Power Technology |
| **TA-2.4** | 11:00 | D. L. H. Lambert and **R. D. Dupuis** | dupuis@mail.utexas.edu | Modeling of AlGaN HFET Performance |
| **TA-2.5** | 11:15 | **W. Yang**, T. Nohava, R. Torreano, S. McPherson, and H. Marsh | yang_wei@htc.honeywell.com | High Gain GaN/AlGaN Heterojunction Phototransistor |
| **TA-2.6** | 11:30 | **J. C. Carrano**, T. Li, D. Brown, P. A. Grudowski, C. J. Eiting, R. D. Dupuis, and J. C. Campbell | jcarrano@mail.utexas.edu | High-speed UV III-V Nitride Photodetectors |
| **TA-2.7** | 11:45 | **M. Schurman**, J. Ramer, C. Tran, I. Ferguson, T. Li, J. C. Carrano, and J. C. Campbell | matt@emcore.com | The Relationship in Material Quality to Breakdown Mechanisms in AlGaN Based Photodetectors |
| **TA-2.8** | 12:00 | **S. Krishnankutty**, W. Yang, and T. Nohava | krishnankutty_subash@htc.honeywell.com | Growth and Characterization of AlGaN and Development of AlGaN Based Photodiodes |
| TA-2HT | 12:15 | *Short Presentations & Hot Topic Discussions* | | |
| | | | | |
| | 12:30 | ***LUNCH — ON YOUR OWN — EXPLORE St. Louis*** | | |

# *Fifth Wide Bandgap Nitride Semiconductor Workshop Schedule, St. Louis MO, 4-7 August 1998*



| Session | Time | Authors (Presenter's Name in Bold) | Contact e-Mail | Title of Talk |
|---|---|---|---|---|
| *TP-1* | 2:00 | *Optoelectronic Devices and Processing —* | | |
| **TP-1.1** | 2:00 | **H. P. Maruska**, M. Lioubtshenko, M. Osinski, S. Pearton, and R. Shul | maruskap@pop.tiac.net | GaN Blue Light-Emitting Diodes Created by Ion Implantation |
| **TP-1.2** | 2:15 | **C. H. Chen**, G. Christienson, W. Goetz, S. Lester, H. Liu, P. Martin, S. Kern, M. Perry, S. Rudaz, D. Steigerwald, J. Yu, L. Cook, R. M. Fletcher, C. P. Kuo, and M. G. Craford | changhua_chen@hp.com | Bright Nitride LEDs by MOCVD |
| **TP-1.3** | 2:30 | **D. A. Stocker**, E. F. Schubert, K. S. Boutros, and J. M. Redwing | efs@bu.edu | Fabrication of Smooth GaN-based Laser Facets |
| **TP-1.4** | 2:45 | A. C. Abare, M. P. Mack, M. Hansen, R. K. Sink, P. Kozodoy, S. Keller, J. S. Speck, J. E. Bowers, U. K. Mishra, L. A. Coldren, and **S. P. DenBaars** | denbaars@engineering.ucsb.edu | Cleaved and Etched Facet Blue-violet Laser Diodes |
| **TP-1.5** | 3:00 | **J. J. Song**, S. Bidnyk, T. J. Schmidt, Y. H. Cho, S. Keller, S. P. DenBaars and W. Yang | jjsong@okway.okstate.edu | Stimulated Emission Studies of MOCVD-Grown GaN and InGaN Structures |
| **TP-1.6** | 3:15 | **J. E. Edmond**, K. Doverspike, H. K. Kong, M. Leonard, H. Dieringer, and D. Emerson. | john_edmond@cree.com | GaN Based Emitters on SiC Grown by MOCVD |
| TP-1HT | 3:30 | *Short Presentations & Hot Topic Discussions* | | |
| | | | | |
| | 3:45 | *BREAK* | | |
| | | | | |
| *TP-2* | 4:00 | *Optical Characterization of Nitride Materials —* | | |
| **TP-2.1** | 4:00 | **M. J. Bergman**, H. C. Casey, Jr., J. F. Muth, Y. C. Chang, R. M. Kolbas, R. A. Rao, C. B. Eom, and M. Schurman | mjb@phy.duke.edu | Optical Properties of Mg-doped Al 0.09 Ga 0.91 N with Protrusions from a Smooth Surface |
| **TP-2.2** | 4:15 | Y. H. Cho, T. J. Schmidt, S. Bidnyk, G. H. Gainer, **J. J. Song**, S. Keller, S. P. DenBaars | jjsong@okway.okstate.edu | Optical Characterization of GaN, InGaN, and InGaN/GaN Multiple Quantum Wells Grown by Metalorganic Chemical Vapor Deposition |
| **TP-2.3** | 4:30 | **A. Eisenbach**, D. Pavlidis, A. Philippe, C. Bru-Chevallier, C. Dubois, and G. Guillot | pavlidis@umich.edu | Photoluminescence and X-ray Diffraction Characteristics of GaN Layers Grown on Sapphire and SOI Substrates |
| **TP-2.4** | 4:45 | **M. Osinski**, P. G. Eliseev, and V. A. Smagley | osinski@chtm.unm.edu | Band-Tailing Effects in Optical Properties of InGaN Films |
| **TP-2.5** | 5:00 | S. Kim, S. J. Rhee, J. M. Myoung, K. Kim, X. Li, J. J. Coleman, and **S. G. Bishop** | sgbishop@uiuc.edu | A Study of Er3+ Photoluminescence (PL) in Er-implanted GaN |
| **TP-2.6** | 5:15 | **M. Feng**, H. Hsia, Z. Tang, D. Becher, R. D. Dupuis, P. A. Grudowski, and C. J. Eiting | mfeng@hsic.ccsm.uiuc.edu | Optical and Electrical Studies of Ion-Implanted GaN |
| **TP-2.7** | 5:30 | E. Iliopoulos, D. Doppalapudi, H. M. Ng, and **T. D. Moustakas** | tdm@panda.bu.edu | Near Bandgap Photoluminescence in n-GaN Films |
| TP-2HT | 5:45 | *Short Presentations & Hot Topic Discussions* | | |
| | | | | |
| | 7:00 | ***WORKSHOP BUFFET DINNER—Adam's Mark Hotel Room ???*** | | |

# Fifth Wide Bandgap Nitride Semiconductor Workshop Schedule, St. Louis MO, 4-7 August 1998



| Session | Time | Authors (Presenter's Name in Bold) | Contact e-Mail | Title of Talk |
|---|---|---|---|---|
| *FRI 8/7* | 7:15 | *CONTINENTAL BREAKFAST* | | |
| | | | | |
| *FA-1* | 8:30 | *Materials Characterization —* | | |
| **FA-1.1** | 8:30 | **M. D. Bremser**, H. Protzmann, B. Wachtendorf, O. Schoen, D. Schmitz, M. Heuken, E. Woelk, and H. Juergensen | mb@aixtron.com | Growth of InGaN/GaN Device Structures for the Optimization of Multiwafer MOVPE Reactors |
| **FA-1.2** | 8:45 | **Z. Liliental-Weber**, B. Monemar, and J. Washburn | z_liliental-weber@lbl.gov | Polarity of Homoepitaxial and Heteroepitaxial GaN |
| **FA-1.3** | 9:00 | **Z. Q. Fang**, D. C. Reynolds, and D. C. Look | zqf@corvus.wright.edu | Electrical Characterization Associated with Degradation of InGaN Blue Light-Emitting Diodes |
| **FA-1.4** | 9:15 | A. K. Fung, J. A. Borton, **M. I. Nathan**, J. M. Van Hove, and R. Hickman II | afung@ece.umn.edu | A Study of the Electrical Characteristics of Various Metal Contacts to p-type GaN |
| **FA-1.5** | 9:30 | **A. Saxler**, M. Ahoujja, W. C. Mitchel, P. Kung, X. Zhang, D. Walker, and M. Razeghi | saxleraw@ml.wpafb.af.mil | Electrical Properties of AlGaN Growth |
| **FA-1.6** | 9:45 | **A. K. Rice** and K. J. Malloy | arice@chtm.chtm.unm.edu | Temperature Dependent Hall Measurements and Noise Processed in Magnesium-Doped GaN Grown on Sapphire |
| **FA-1.7** | 10:00 | **D. C. Look** and J. R. Sizelove | lookd@el.wpafb.af.mil | Effect of Threading Dislocations on Mobility in GaN |
| FA-1HT | 10:15 | *Short Presentations & Hot Topic Discussions* | | |
| | 10:30 | ***Closing Remarks*** | | |
| | | | | |
| | 10:45 | *BREAK* | | |
| | | | | |
| | 11:00 | *END OF WORKSHOP* | | |

4-7 August, 1998, St. Louis MO

| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| 1 | No | Authors (Presenter Bold) | Presenter's e-Mail | Title of Talk | Sess. | Time | Paper Topic | Other Topics | Notes |
| 2 | 1 | M. Suscavage, M. Harris, D. Bliss, P. Yip, S. Q. Wang, D. Schwall, L. Bouthillette, **M. N. Alexander**, J. Bailey, M. Callahan, D. C. Look, D. C. Reynolds, R. L. Jones, and C. W. Litton | alexande@maxwell.rl.plh.af.mil | High Quality Hydrothermal ZnO Crystals | | | 1 | | |
| 3 | 2 | **L. J. Schowalter** | schowl@rpi.edu | Bulk AlN Substrate Characterization | | | 1 | | |
| 4 | 3 | **J. E. Nause** and G. Agarwal | cermeting@juno.com | Growth of Bulk ZnO Crystals for Wide Bandgap Applications | | | 1 | | |
| 5 | 4 | R. Held, S. Seutter, B. E. Ishaug, A. Parkhomovsky, A. M. Dabiran, and **P. I. Cohen** | cohen@ece.umn.edu | Nitride MBE on Bulk Substrates | | | 3 | | |
| 6 | 5 | **W. J. Schaff** | schaff@iiiv.tn.cornell.edu | MBE Growth of Normal and Inverted 2-dimensional Electron Gases in GaN | | | 3 | | |
| 7 | 6 | **H. Morkoç** | hmorkoc@vcu.edu | Will the real piezoelectric effect standup? | | | 3 | | |
| 8 | 7 | **C. W. Litton**, D. C. Reynolds, J. Van Nostrand, and D. C. Look | litton@el.wpafb.af.mil | Reactive MBE growth and characteriztion of GaN on the polar faces of bulk C-plane ZnO substrates | | | 3 | | |
| 9 | 8 | **R. Molnar** | rmolnar@ll.mit.edu | VPE of GaN | | | 4 | | |
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The fifth St. Luois Workshop in Wide Bandgap Nitrides was held August 4-7, 1998 in St. Louis, MO. The workshop was attended by some 80 researchers from mainly the United States and very topical and bottleneck type problems/issues were discussed. The workshop is unique in its approach in that short presentations on pertinent issues are followed by lengthy discussion. Following a group of womewhat related presentations, an overall discussion period involving the authors of that session and the audience is conducted. The forum provides a plenty of time for discussions of important and unresolved issues as opposed presenting polished and infished results typically presented in standard/conventional meeting. The participants over the years have been and are still supportive of the role the workshop plays for the community. It should b ementioned that this workshop carries the distinction of being the first ever meeting in the field in the world.

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