Draft Programme for UKNC Conference, Cardiff

8th-9th January 2020

Institute for Compound Semiconductors

Sefydliad Lled-ddargludyddion Cyfansawdd

Wednesday 8th January

10.15-10.40: Arrival/Registration/Coffee

10.40-10.45: Opening remarks (Rachel Oliver / Philip Shields / David Wallis)

10.45 – 12.45: Session 1 – Defects and characterisation
Chairs: TBC

10.45-11.30: **The Humphreys Lecture**
Defects in Nitride semiconductors
Zlatko Sitar
North Carolina State University, Materials Science and Engineering, 911 Partners Way, Raleigh, NC, 27695-7907, USA.

11.30-11.45: *Defects introduction during sputter deposition on GaN semiconductor*
Xiaoyan Tang[1], Simon Hammersley[1], Vladimir Markevich[1], Ian Hawkins[1], Iain Crowe[1], Trevor Martin[2], Tony Peaker[1], Matthew Halsall[1]

[1] Photon Science Institute and School of Electrical & Electronic Engineering, The University of Manchester, Manchester, M13 9PL, UK
[2] IQE, Pascal Close, Cardiff, CF3 0LW, UK

11.45-12.00: *DLTS of Defects in GaN Produced by 6MeV Electron Irradiation*
Simon Hammersley[1], Xiaoyan Tang[1], Vladimir Markevich[1], Ian Hawkins[1], Iain Crowe[1], Trevor Martin[2], Tony Peaker[1], Matthew Halsall[1]

[1] Photon Science Institute and School of Electrical & Electronic Engineering, The University of Manchester, Manchester, M13 9PL, UK
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12.00-12.15 *Investigating the structural properties of AlN thin films grown on nano-patterned sapphire substrates in the scanning electron microscope*
C. Trager-Cowan[1], A. Alasamari[1], W. Avis[1], J. Bruckbauer[1], G. Ferenczi[1], B. Hourahine[1], G. Kusch[1*], R.W. Martin[1], R. McDermott[1], G. Naresh-Kumar[1], S. Hagedorn[2], S. Walde[2], M. Weyers[2], P.-M. Coulon[3], P. A. Shields[3] and A. Winkelmann[4]

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[2] Ferdinand-Braun-Institut, Leibnitz-Institut für Höchstfrequenztechnik, 12489 Berlin, Germany
[3] Department of Electronic and Electrical Engineering, Centre of Nanoscience & Nanotechnology, University of Bath, Bath, BA2 7AY, UK
[4] Academic Centre for Materials and Nanotechnology, AGH University of Science and Technology, 30-059 Krakow, Poland *Now at Department of Materials Science and Metallurgy, University of Cambridge, Cambridge CB3 0FS, UK

12.15-12.30: *Temperature Dependent Cathodoluminescence of Closed-Packed Arrays of GaN Inverted Nanopyramids*

P. Bozinakis[1], P.M. Coulon[2], G. Kusch[3], J. Bruckbauer[1], P.R. Edwards[1], R.A. Oliver[3], P.A. Shields[2], R.W. Martin[1]

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[3] Department of Materials Science and Metallurgy, University of Cambridge, Cambridge CB3 0FS, UK

12.30-12.45: *Three Posture Cathodoluminescence for Nanostructure Characterisation*

Douglas Cameron[1], Paul R. Edwards[1], Pierre-Marie Coulon[2], Phillip A. Sheilds[2], Robert W. Martin[1]

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[2] Department of Electronic and Electrical Engineering, Centre of Nanoscience & Nanotechnology, University of Bath, Bath, BA2 7AY, UK

12.45-13.45: Lunch

13.45-15.30: Session 2 – Novel and emerging materials
Chairs: TBC

13.45-14.00 *Corundum α-Ga_2O_3 by atomic layer deposition: growth, detector application and prospects for bandgap engineering*

F. Massabuau[1,2,] J. Moloney[2], A. Barthel[2], O. Tesh[2], B. Ding[2], J. Jarman[2], L. Lee[2], T. Huq[2], J. Brister[2], M. Napari[2], R. Oliver[2], M. Singh[3], S. Karboyan[3], M. Kuball[3], J. Gibbon[4], L. Jones[4], V. Dhanak[4], L. Phillips[4], J. Major[4], A. Kovacs[5], T. Sajavaara[6], J. Roberts[7], P. Chalker[7]

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[6] Department of Physics, University of Jyvaskyla, FI-40014 Jyvaskyla, Finland
[7] School of Engineering, The University of Liverpool, Liverpool L69 3GH, UK

14.00-14.15: *Direct band-gap crossover in epitaxial monolayer boron nitride*
T.S. Cheng[1], A. Summerfield[1], C.J. Mellor[1], C. Elias[2], P. Valvin[2], T. Pelini[2], B. Gil[2], G. Cassabois[2], L. Eaves[1], C.T. Foxon[1], P.H. Beton[1], S.V. Novikov[1]

[1] School of Physics and Astronomy, University of Nottingham, Nottingham, UK
[2] Laboratoire Charles Coulomb, UMR5221 CNRS-Université de Montpellier, Montpellier, France

14.15-14.30: *Superconducting boron doped diamond on boron nitride ceramics*
Soumen Mandal[1], Henry Bland[1], Jerome A. Cuenca[1], Malcolm Snowball[2], Oliver A. Williams[1]

[1] School of Physics and Astronomy, Cardiff University, Cardiff, UK
[2] Ultra Biotecs Limited, Derby, UK

14.30-14.45: *High Piezoelectricity in Porous GaN*
Yonatan Calahorra, Adina Wineman, Bogdan Spiridon, Peter Griffin, Sohini Kar-Narayan, Rachel Oliver

Department of Materials Science and Metallurgy, University of Cambridge, Cambridge CB3 0FS, UK

14.45-15.00: *Stacking fault induced alloy segregation in Zincblende GaN heterostructure*
Boning Ding[1], Simon Fairclough[1], Martin Frentrup[1], Menno Kappers[1], Andras Kovács[2], Gunnar Kusch[1], David Wallis[1,3,4], Rachel Oliver[1]

[1] Department of Materials Science and Metallurgy, University of Cambridge, Cambridge CB3 0FS, UK
[2] Forschungszentrum Jülich
[3] Centre for High Frequency Engineering, University of Cardiff, 5 The Parade, Newport Road, CF24 3AA, Cardiff, UK
[4] Kubos Semiconductors Ltd

15.00-15.15: *Study of $Al_xGa_{1-x}N$ nucleation layers for the growth of cubic zincblende GaN*
Abhiram Gundimeda[1], Martin Frentrup[1], Simon M. Fairclough[1], Alexander Hinz[1], Huixin Xiu[1,2], Menno J. Kappers[1], David J. Wallis[1,3], Rachel A. Oliver[1]

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[3] Centre for High Frequency Engineering, University of Cardiff, 5 The Parade, Newport Road, CF24 3AA, Cardiff, UK

15.15-15.45: Tea

15.45-17.30 Session 3 – Nano and quantum
Chairs: TBC

15.45-16.00: *Creation of an AlN topographical surface for the site-control of III-N quantum dots*

Robert Armstrong[1], Pierre-Marie Coulon[1], Pavlos Bozinakis[2], Robert Martin[2], Daniel Wolverson[3], Philip Shields[1]

[1] Department of Electrical and Electronic Engineering, University of Bath, Bath, UK
[2] Department of Physics, SUPA, University of Strathclyde, Glasgow, G4 0NG, UK
[3] Department of Physics, University of Bath, Bath, BA2 7AY, UK

16.00-16.15: *Decreased spectral diffusion rate of a non-polar InGaN quantum dot*

C. C. Kocher[1], T. Zhu[2], J. C. Jarman[2], R. A. Oliver[2], R. A. Taylor[1]

[1] Department of Physics, University of Oxford, Parks Rd, Oxford OX1 3PJ, UK
[2] Department of Materials Science and Metallurgy, University of Cambridge, Cambridge CB3 0FS, UK

16.15-16.30: *Influence of MOVPE environment on the selective area thermal etching of GaN nanohole arrays*

Pierre-Marie Coulon[1], Peng Feng[2], Tao Wang[2], Philip A. Shields[1]

[1] Department of Electrical & Electronic Engineering, University of Bath, Bath, BA2 7AY, UK
[2] Department of Electronic and Electrical Engineering, University of Sheffield, S1 4DE, UK

16.30-16.45: *Room Temperature Quantum Light From Colour Centres in the Nitrides*

Sam Bishop[1], J.P. Hadden[2], Diana Huffaker[1,2], Anthony J. Bennett[1]

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[2] School of Physics and Astronomy, Cardiff University, Queen's Buildings, The Parade, Cardiff, CF24 3AA, UK

16.45-17.30 **The Foxon Lecture**

Challenges for GaN to achieve its theoretical promise for power electronics

Mike Uren
HH Wills Physics Laboratory, University of Bristol, Tyndall Avenue, Bristol BS8 1TL

17.30-18.30 AGM

19.30-22.30 Conference dinner

Thursday 9th January

9.00-10.30: Session 4 – Electronic devices
Chairs: TBC

9.00-9.45: *Towards the limits of GaN electronics*
Elison Matioli
EPFL STI IEL POWERLAB, ELD 012 (Bâtiment ELD), Station 11, CH-1015 Lausanne, Switzerland.

9.45-10.00: *A new method to achieve GaN power electronics approaching its intrinsic limits*
S. Jiang, Y. Cai, P. Feng, S. Shen, X. Zhao, P. Fletcher, V. Esendag, K. Lee, T. Wang

Department of Electronic and Electrical Engineering, University of Sheffield, UK

10.00-10.15: *Field Plate Design in ALGaN/GaN HEMTs for High Speed Monolithically Integrated DC-DC Converters*
Joseph Pinchbeck, Srikanth Devireddy, Sheng Jiang, Kean Boon Lee, Peter Houston

The University of Sheffield, Western Bank, Sheffield S10 2TN, UK

10.15-10.30: *High-temperature contact stability of 2DEG heater on GaN membrane for sensing applications*
Bogdan Spiridon[1], Andrea De Luca[2], Abdalla Eblabla[3], Saptarsi Ghosh[1], Simon Fairclough[1], Giorgia Longobardi[2], Khaled Elgaid[3], Florin Udrea[2], David Wallis[1,3], Rachel Oliver[1]

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[3] Centre for High-Frequency Engineering, Cardiff University, UK

10.30-10.45: *Low Field Vertical Charge Transport in AlGaN/GaN – on – Si High Electron Mobility Transistors*
Filip Wach[1], Michael J Uren[1], Benoit Bakeroot[2], Steve Stoffels[2], Ming Zhao[2], Stefaan Decoutere[2], Martin Kuball[1]

[1] Centre for Device Thermography and Reliability (CDTR), H. H. Wills Physics Laboratory, University of Bristol, UK
[2] imec 3001 Leuven, Belgium

10.45-11.00: *Study of drain injected breakdown mechanisms in AlGaN/GaN-on-SiC HEMTs*
Feiyuan Yang[1], Manikant Singh[1], Michael J. Uren[1], Hassan Hirshy[2], Paul J. Tasker[2], Trevor Martin[3], Martin Kuball[1]

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[2] Centre for High Frequency Engineering, Cardiff University, UK
[3] IQE Europe, St Mellons, Cardiff, UK

11.00-11.30: Coffee

11.30-12.30: Session 5 – Systems and applications
Chairs: TBC

11.30-11.45: *Gallium Nitride: a versatile compound semiconductor as novel piezoelectric film for acoustic tweezer in manipulation of cancer cells*
Chao Sun[1,2], Fangda Wu[2], David J. Wallis[2,3], Ming Hong Shen[4], Fan Yuan[5], Jian Yang[4], Jianzhong Wu[2], Zhihua Xie[6], Dongfang Liang[7], Hanlin Wang[2], Rowan Tickle[2], Roman Mikhaylov[2], Aled Clayton[8], You Zhou[9], Zhenlin Wu[10], Yongqing Fu[11], Wenpeng Xun[12], Xin Yang[2]

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[8] Tissue Microenvironment Group, Division of Cancer & Genetics, School of Medicine, Cardiff University, Cardiff, CF14 4XN, UK
[9] Systems Immunity University Research Institute and Division of Infection and Immunity, School of Medicine, Cardiff University, Cardiff, CF14 4XN, UK
[10] School of Optoelectronic Engineering and Instrumentation Science, Dalian University of Technology, 116023, P.R. China
[11] Faculty of Engineering and Environment, Northumbria University, Newcastle Upon Tyne, NE1 8ST, UK
[12] Department of Mechanical Engineering, Northwestern Polytechnical University, 710072, P.R. China

11.45-12.00: *Gb/s Underwater Wireless Optical Communications using micro-LEDs*
Georgios N. Arvanitakis[1], Jonathan J.D. McKendry[1], Rui Bian[2], Chen Cheng[2], Enyuan Xie[1], Xiangyu He[1], Gang Yang[3], Mohamed S. Islim[2], Ardimas A. Purwita[2], Erdan Gu[1], Harald Haas[2], Martin D. Dawson[1]

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[3] Institute of Marine Optoelectronic Equipment, Harbin Institute of Technology at WeiHai, WeiHai 264209, China

12.00-12.15: *Hybrid GaN microLED platform for fluorescence sensing*
F. Farrell[1,2], N. Bruce[1,2], X. He[1], E. Xie[1], A.-M. Haughey[2], E. Gu[1], M. D. Dawson[1], N. Laurand[1]

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[2] Fraunhofer Centre for Applied Photonics, 99 George St, Glasgow G1 1RD, UK

12.15-12.30: *Superior performance metal- semiconductor-metal photodiode on non-polar (11-20) GaN with patterned (110) silicon*
Y. Cai, S Shen, X. Zhao, C. Zhu, J. Bai, T. Wang

Department of Electronic and Electrical Engineering, University of Sheffield, Sheffield, S1 3JD

12.30-12.45 *Transfer printing integration of GaN micro-LEDs on CMOS*
Jose F. C. Carreira[1], Alexander D. Griffiths[1], Enyuan Xie[1], Benoit J. E. Guilhabert[1], Johannes Herrnsdorf[1], Robert K. Henderson[2], Erdan Gu[1], Michael J. Strain[1], Martin D. Dawson[1]

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[2] Joint Research Institute for Integrated Systems University of Edinburgh, Edinburgh, UK

12.45-14.00: Lunch and Poster Session

14.00-15.00: Session 6 – Integration of GaN and Diamond
Chairs: TBC

14.00-14.15: *Development of a hybrid diamond-on-GaN photonic platform*
Jack Smith[1,2], Paul Hill[1,2,3], Charalambos Klitis[4], Erdan Gu[1], Martin D. Dawson[1], Michael J. Strain[1]

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[2] Diamond Science and Technology, Centre for Doctoral Training, University of Warwick, Gibbet Hill Road, Coventry, CV4 7AL, UK

[3] Currently at: Biomedical Engineering, John Anderson Building, 107 Rottenrow E, University of Strathclyde, Glasgow, G4 0NG, UK
[4] School of Engineering, University of Glasgow, Glasgow, G12 8LT, UK

14.15-14.30: *Integrated GaN-Diamond Microwave Electronics (GaN-DaME): Plasma etching of III-nitrides for GaN-on-diamond substrate production*
Matthew D Smith[1], Jerome Cuenca[2], Daniel E Field[3], Simon Fairclough[4], James Pomeroy[3], Rachel Oliver[4], Oliver Williams[2], Iain Thayne[1], Martin Kuball[3]

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[2] Cardiff University, Cardiff, CF10 3AT, UK
[3] University of Bristol, Senate House, Tyndall Ave, Bristol, BS8 1TH, UK
[4] Department of Materials Science and Metallurgy, University of Cambridge, Cambridge CB3 0FS, UK

14.30-14.45: *Investigating the interfacial toughness and thermal resistance of GaN-on-diamond*
Daniel E. Field[1,2], Chao Yuan[1], Roland B. Simon[3], Daniel Twitchen[4], Daniel Francis[4], Firooz Faili[4], Dong Liu[1], Martin Kuball[1]

[1] Centre for Device Thermography and Reliability, H. H. Wills Physics Laboratory, University of Bristol, UK
[2] Centre for Diamond Science and Technology, UK
[3] ThermMap Solutions, Bristol, UK
[4] Element Six, 3901 Burton Drive, Santa Clara, California, USA

14.45-15.00: *Modelling Thermal Stress in CVD Diamond On GaN Using Membrane Structures*
Jerome A. Cuenca[1], Matthew Smith[2], Daniel Field[3], James Pomeroy[3], Fabien Massabuau[4], Soumen Mandal[1], Rachel A. Oliver[4], Iain Thayne[2], Martin Kuball[3], Oliver Williams[1]

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15.00-15.30: Tea

15.30–16.30: Session 7 – LEDs and LED-related materials
Chairs: TBC

15.30-15.45: *Carrier localization in polar InGaN QWs: Consequences for the temperature dependence of the radiative recombination*
Joshua M. McMahon[1,2], Daniel S. P. Tanner[1], Emmanouil Kioupakis[3], Stefan Schulz[1]

[1] Tyndall National Institute, University College Cork, Lee Maltings, Dyke Parade, Cork, Ireland
[2] Department of Physics, University College Cork, Cork City, Cork, Ireland
[3] Materials Science and Engineering Department, University of Michigan, 2300 Hayward St., Ann Arbor, Michigan 48109, USA

15.45-16.00: *Semi-polar InGaN-based green LEDs with super-lattice on patterned silicon*
X. Zhao1, K. Huang[1], J. Bruckbauer[2], S. Shen[1], C. Zhu[1], P. Fletcher[1], F. Peng[1], Y. Cai[1], J. Bai[1], C. Trager-Cowan[2], R. Martin[2], T. Wang[1*]

[1] Department of Electronic and Electrical Engineering, University of Sheffield, Sheffield, S1 3JD, UK
[2] Department of Physics, SUPA, University of Strathclyde, Glasgow, G4 0NG, UK

16.00-16.15: *From the electronic structure to transport properties of III-N based quantum well systems: Connecting atomistic and continuum-based models*
Debapriya Chaudhuri[1], M. O'Donovan[1,2], S. K. Patra[1], T. Streckenbach[3], O. Marquardt[3], P. Farrell[3], T. Koprucki[3], Stefan Schulz[1]

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[2] Department of Physics, University College Cork, Cork T12 YN60, Ireland
[3] Weierstrass Institute (WIAS), Mohrenstr. 39, 10117 Berlin, Germany

16.15-16.30: *Polarised room temperature photoluminescence from zincblende InGaN/GaN quantum wells grown using MOVPE on 3C-SiC/Si (001) substrates*
S. A. Church[1], B. Ding[2], P. W. Mitchell[1], M. J. Kappers[2], S. Fairclough[2], G. Kusch[2], M. Frentrup[2], D. J. Wallis[2,3,4], R. A. Oliver[2], D. J. Binks[1], P. Dawson[1]

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[3] Kubos Semiconductors Ltd, Future Business Centre, King's Hedges Road, Cambridge, UK
[4] Centre for High Frequency Engineering, University of Cardiff, UK

16.30-16.35: Concluding remarks and prize-giving

List of Posters

Comparison of Micron-scale Spatial Variation of Photoluminesence between Blue- and Green-emitting InGaN/GaN Multiple Quantum Wells
R. Barrett[1], R. Ahumada-Lazo[1], J.A. Alanis[1], P. Parkinson[1], S. A. Church[1], M. J. Kappers[2], R. A. Oliver[2], D. J. Binks[1]

[1] Photon Science Institute & Department of Physics and Astronomy, University of Manchester, UK
[2] Department of Materials Science and Metallurgy, University of Cambridge, Cambridge, UK

Displacement Talbot Lithography for nano-engineering of III-nitride materials
Pierre-Marie Coulon[1], Benjamin Damilano[2], Blandine Alloing[2], Pierre Chausse[1], Sebastian Walde[3], Johannes Enslin[4], Robert Armstrong[1], Stéphane Vézian[2], Sylvia Hagedorn[3], Tim Wernicke[4], Jean Massies[2], Jesus Zúñiga-Pérez[2], Markus Weyers[3], Michael Kneissl[3,4], Philip A. Shields[1]

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[2] Université Côte d'Azur, CNRS, CRHEA, rue B. Gregory, 06560 Valbonne, France
[3] Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, 12489 Berlin, Germany
[4] Technische Universität Berlin, Institute of Solid State Physics, 10623 Berlin, Germany

Effect of Mg concentration on the optical properties of Mg doped zinc-blende GaN epilayers
Daniel Dyer[1], Stephen A. Church[1], Peter W. Mitchell[1], Menno J. Kappers[2], David J. Wallis[2,3,4], Rachel A. Oliver[2], David J. Binks[1]

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Excited State Deep Level Transient Spectroscopy
Simon Hammersley, Xiaoyan Tang, Vladimir Markevich, Ian Hawkins, Iain Crowe, Tony Peaker, Matthew Halsall

Photon Science Institute and Department of ELectrical and Electronic Engineering, University of Manchester, Manchester, M13 9PL, UK

Modified localization landscape theory for studying the electronic structure of III-nitride quantum wells
Debapriya Chaudhuri[1], John C. Kelleher[2], Megan R. O'Brien[3], Eoin P. O'Reilly[4], Stefan Schulz[5]

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[2] Department of Physics, University College Cork, T12 YN60, Ireland
[3] Tyndall National Institute, University College Cork, T12 R5CP, Ireland, Department of Physics, University College Cork, T12 YN60, Ireland
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Surface Morphologies of Cubic GaN
Thomas J. Wade[1], Abhiram Gundimeda[1], Martin Frentrup[1], Gunnar Kusch[1], Menno J. Kappers[1], David J. Wallis[1,2], Rachel A. Oliver[1]

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[2] Centre for High Frequency Engineering, University of Cardiff, 5 The Parade, Newport Road, CF24 3AA, Cardiff, UK

Thermal management of GaN power devices with 3D printed polymeric micro-jet impingement channel

G. Zhang[1], H. Cao[1], M. E. Navarro[1], J.W. Pomeroy[2], M. Kuball[2], Y. Ding[1*]

[1] Birmingham Centre for Energy Storage, School of Chemical Engineering, University of Birmingham, UK
[2] Centre for Device Thermography and Reliability, H.H. Wills Physics Laboratory, University of Bristol, UK

Variation of the Emission Properties of Blue and Green emitting InGaN/GaN Multiple Quantum Wells with Growth Temperature

R. Ahumada-Lazo[1], R. Barrett[1], J.A. Alanis[1], S. Skalsky[1], P. Parkinson[1], S. A. Church[1], M. J. Kappers[2], R. A. Oliver[2], D. J. Binks[1]

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Photoluminescence of zincblende InGaN/GaN quantum wells with different thicknesses

K. Cooley-Greene[1], M. Quinn[1], S. A. Church[1], M. J. Kappers[2], D. J. Wallis[2,3,4], R. A. Oliver[2], D. J. Binks[1]
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