

# ERIC A. DECUIR JR.

Citizenship: U.S.A.

## STATEMENT OF PURPOSE

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Utilize my passion for research and engineering to explore new areas of research aimed at furthering our understandings of the world around us yet facilitating the evolution of pure research to tangibles.

## EXPERTISE

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Growth and characterization of semiconductor nanostructures for optoelectronic applications including, near infrared optical communication, multi-color photodetectors, and photovoltaic devices.

## EDUCATION

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2005 – 2008: Ph.D.: Microelectronics-Photonics, University of Arkansas, Fayetteville, AR. 72701 *GPA: 3.72/4.0*, Dissertation: “*Cubic and Hexagonal GaN/AlN Superlattice structures for near- infrared Detector applications.*”

2003 – 2005, M.S.: Microelectronics-Photonics, University of Arkansas, Fayetteville, AR. 72701 *GPA: 3.79/4.0*, Thesis: “*Characterization Of Intersubband Transitions In  $Al_xGa_{1-x}N/GaN$  Multiple Quantum Well Structures: For Near-Infrared Detector Applications.*”

1998 – 2002, B.S.: Electrical Engineering-Telecommunications, University of Louisiana at Lafayette, Lafayette, LA 70501 *GPA: 3.30/4.0*

## WORK EXPERIENCE

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**4/12/2010-Present: ORAU Postdoctoral Fellow**, Sensors and Electron Devices Directorate, Army Research Laboratory, Adelphi, MD:

Responsibilities include research oriented toward Type II superlattice materials for Mid and Far-Infrared Imaging systems. Current duties are focused on developing novel passivation schemes aimed at reducing the effective dark current densities in Gallium Antimonide (GaSb) and Indium Arsenide (InAs) superlattice structures such that reproducibility and functionality may be maintained for the production of high performance next-generation infrared imaging systems.

**1/1/2009 – 4/6/2010: Research Associate**, Department of Physics and Electrical Engineering, University of Arkansas, Fayetteville, AR:

Responsibilities include research oriented towards MBE growth, optical, electrical, and structural characterization of III-Nitride materials for optoelectronic applications. Also responsible for coordinating installation and characterization of Reactive Ion Etching (RIE) equipment, maintaining spectroscopy and UHV equipment, and training and assisting students in the use of lab equipment.

**8/15/2003 – 12/31/2009: *Research Assistant***, Department of Electrical Engineering, University of Arkansas, Fayetteville, AR:

The research is focused on MBE growth, optical, electrical, and structural characterization of III-Nitride materials. Research includes growth of multiple quantum well structures for near infrared detector applications. Experience includes: Growth of nanostructures using a VEECO Gen II MBE system and use of various metrology tools such as FTIR spectrometers, Electrochemical Capacitance Voltage (ECV), X-ray Diffraction (XRD), and Atomic Force Microscope (AFM). Additional clean room experience (Class 100) including fabrication and processing experience using: Karl Suss mask aligner, Dektak profilometer, Keithley I-V profilers, metal deposition equipment (E-beam and sputtering), wet and dry etching, and wire bonders.

**5/15/2004 – 8/15/2006: *NSF IGERT Fellow***, University of Arkansas, Fayetteville, AR:

NSF funded program which involves an in-depth, multidisciplinary education through coursework and research experience.

**6/1/2005 – 8/1/2005: *Visiting Researcher***, University of Paderborn, Germany:

Participated in epitaxial growth of cubic III-nitrides heterostructures (c-AlGa<sub>N</sub>/c-GaN) utilizing a Riber 32 MBE growth system. In-situ monitoring was achieved through Reflection High Energy Electron Diffraction (RHEED). Designed and investigated these structures for the presence of intersubband transitions in the near and mid infrared spectral range.

**8/15/2003 – 5/15/2004: *NSF GK-12 Fellow***, University of Arkansas, Fayetteville, AR

NSF funded program aimed at stimulating interest in mathematics and science by providing inquiry based lesson plans that are designed to tap into a child's natural curiosity to explore and question the world around them. In essence, this program is designed as a vehicle for inspiring next generation scientists and engineers.

**8/15/2002 – 5/15/2003: *Peer Counselor Tutor***, ULL Special Services, Lafayette, LA.

Responsibilities include counseling and tutoring students in Mathematics and Electrical Engineering courses.

**2/1/1999 – 8/15/2002: *Supervisor of Lines and Signs***, ULL Parking and Transit Lafayette, LA

Responsibilities include computer-aided design of campus signs and maintaining parking accommodations.

## EDUCATIONAL ACTIVITIES AND MENTORSHIPS

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### **GK-12 Fellowship (2003-2004):**

Participated in teaching and preparing inquiry based lesson plans in a sixth grade math class at Helen Tyson Middle School in Springdale, AR.

### **University of Arkansas: Engineering Day (2005-2008):**

Participated in building and conducting interactive demos demonstrating the use of optoelectronic devices to school kids: *Project: Amplitude modulation of laser light for wireless music transmission.*

**Research Experience for Undergraduates (REU) Mentees (2007-2008):  
Trained and mentored undergraduates for summer research at the University of Arkansas:**

Summer 2007: Tariq Bond (Norfolk State University):  
Research Topic: Solid state white light generation using CdSe/ZnS core/shell nanocrystals.

Summer 2008: Michael Sattler (Arkansas State University):  
Research Topic: MBE growth of Indium Nitride.

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INSTRUMENTATION EXPERTISE

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**University of Arkansas-Optoelectronics Lab (2003-2008):**

Helped establish optoelectronic and dry etching research facilities in the Electrical Engineering department at the University of Arkansas.

**Key lab equipment extensively used and/or modified for experiments:**

***Perkin Elmer Spectrum GX FTIR:*** Worked closely with company to develop a photoresponse measurement system utilizing the analog input port of this FTIR spectrometer such that fabricated detector's spectral response could be quickly measured at various temperatures (4K-300K). Temperature measurements were enabled via a modified sample compartment using a Janis continuous flow cryostat.

***Bruker IFS 125HR FTIR:*** Spectrometer is equipped with Janis continuous flow cryostat and a Lakeshore 331 temperature controller which enabled temperature dependent (4K-300K) transmission and absorption studies.

***Veeco Gen II Nitride MBE:*** System is equipped with In, Al, Ga, Si, Mg, and a RF Nitrogen Plasma source which enabled growth of InN, GaN, AlN, and the corresponding ternary alloys. Si and Mg sources were used for n-type and p-type doping respectively. Trained in UHV/MBE maintenance and repair.

***Trion Minilock III ICP/RIE:*** Coordinated the installation of this chlorine based dry etching system for etching of III-Nitride and III-V materials. Also plumbed and welded all stainless steel gas lines from vacuum equipment to gas cabinets and valve manifold box. Research and installed gas sensors for the detection of hazardous gas leaks in accordance with local safety ordinances and fire codes.

***Veeco Dimension 3100 AFM:*** System is used extensively to analyze the epitaxial surface morphology of III-nitride material.

***Phillips X'Pert XRD:*** System is extensively used to monitor MBE crystalline quality and periodicity of quantum well or superlattice structures.

## PUBLICATIONS AND PRESENTATIONS

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1. D. Guzun, **E.A. DeCuir, Jr.**, V. P. Kunets, Y. I. Mazur, G. J. Salamo, S. Q. Murphy, P. A. R. D. Jayathilaka, T. D. Mishima and M. B. Santos, "Comprehensive doping and temperature studies of spin relaxation in InSb," *Appl. Phys. Lett.*, vol. **95**, pp. 241903-3, 12/14. 2009.
2. Y. I. Mazur, V. G. Dorogan, O. Bierwagen, G. G. Tarasov, **E. A. DeCuir Jr.**, S. Noda, Z. Y. Zhuchenko, M. O. Manasreh, W. T. Masselink and G. J. Salamo, "Spectroscopy of shallow InAs/InP quantum wire nanostructures," *Nanotechnology*, vol. 20, pp. 065401 (10 pp.), 02/11. 2009.
3. **E. A. DeCuir, Jr.**, M.O. Manasreh, Elena Tschumak, J. Schörmann, D.J. As, and K. Lischka. Cubic GaN/AlN multiple quantum well photodetector *Appl. Phys. Lett.* **92** 201910 (2008).
4. D.J. As, J. Schörmann, Elena Tschumak, K. Lischka. **E. A. DeCuir, Jr** and M.O. Manasreh. Growth of non-polar cubic GaN/AlN multiple quantum wells with intersubband transitions for 1.5  $\mu\text{m}$  applications. *phys. stat. sol.(c)* **5** 2092-2095 (2008).
5. Yu. I. Mazur, S. Noda, G.G. Tarasov, V.G. Dorogan, G.J. Salamo, O. Bierwagen, W.T. Masselink, **E. A. DeCuir, Jr.**, M.O. Manasreh. Excitonic band edges and optical anisotropy of InAs/InP quantum dot structures. *J. Appl. Phys.* v 103, n 5, 1 March 2008, p 054315-1-7.
6. B.S.Passmore, Jiang Wu; **E. A. DeCuir, Jr.**, M.O. Manasreh, P.M Lytvyn, E. Marega, Jr., V.P. Kunets, G.J.Salamo. Broadband photoresponse from InAs quantum dots embedded in a graded well for visible to mid-infrared detection. *Proceedings of the SPIE - The International Society for Optical Engineering*, v 6900, 7 Feb. 2008, p 69000O-1-8.
7. B.L. Liang, Yu. I. Mazur<sup>1</sup>, Vas. P. Kunets, Zh. M. Wang, G.J. Salamo, **E. A. DeCuir Jr.**, B. Passmore and M. O. Manasreh. Enhanced photoluminescence from InAs/GaAs surface quantum dots by using a Si-doped interlayer. *Nanotechnology* **19** 065705 (2008).
8. **E. A. DeCuir, Jr.**, Emil Fred, M.O. Manasreh, J. Schörmann, D.J. As, and K. Lischka. Near infrared intersubband absorption in cubic GaN/AlN superlattices. *Mater. Res. Soc. Symp. Proc.* Vol. **955**, 1055-GG13-02 (2008). **Accompanying Presentation:** 2007 Fall MRS Conference, Boston, MA: Oral Presentation.
9. **E. A. DeCuir, Jr.**, Emil Fred, M.O. Manasreh, J. Schörmann, D.J. As, and K. Lischka. Near-infrared Intersubband Absorption in non-polar cubic GaN/AlN superlattices *Appl. Phys. Lett.* **91** 041911(2007).
10. **E. A. DeCuir, Jr.**, Emil Fred, M.O. Manasreh, J. Xie, H. Morkoc, E. Baumann D. Hoffstetter. 1.37-2.90 Intersubband transitions in GaN/AlN superlattices. *Mater. Res. Soc. Symp. Proc.* Vol. **955**, I13-01 (2006). **Accompanying Presentation:** 2006 Fall MRS Conference, Boston, MA: Oral Presentation.
11. **E. A. DeCuir, Jr.**, Emil Fred, B.S. Passmore, A. Muddasani, and M.O. Manasreh., M. E. Ware, G.J. Salamo. Near-infrared wavelength intersubband transitions in GaN/AlN short period superlattices., *Appl. Phys. Lett* **89** 151112(2006).
12. B.L Liang, Zh. M. Wang, Yu. I Mazur, G.J. Salamo, **E. A. DeCuir, Jr.**, M.O. Manasreh.

Correlation between surface and buried InAs quantum dots. *Appl. Phys. Lett.* **89** 043125 (2006).

13. **E. A. DeCuir, Jr.**, Y.C. Chua, B.S. Passmore, J. Liang, M.O. Manasreh, J. Xie, H. Morkoc, A. Asghar, I.T. Ferguson, and A. Payne. Intersubband transitions in GaN/Al<sub>x</sub>Ga<sub>1-x</sub>N multi quantum wells *Mater. Res. Soc. Symp. Proc.* Vol. **829**, B2.29 (2005). **Accompanying Presentation:** 2004 Fall MRS Conference, Boston, MA: Poster Presentation.
14. Y.C. Chua, **E. A. DeCuir, Jr.**, M. O. Manasreh, B. D. Weaver. Intersubband transitions in proton irradiated InGaAs/GaAs multiple quantum dots. *Appl. Phys. Lett.* **87** 091905(2005).
15. Y.C. Chua, J. Liang, B.S. Passmore, **E. A. DeCuir, Jr.**, M.O. Manasreh, Z. Wang, and G.J. Salamo. Intersubband transitions in In<sub>0.3</sub>Ga<sub>0.7</sub>As/GaAs multiple quantum dots of varying dot-sizes. *Mater. Res. Soc. Symp. Proc.* Vol. **829**, B1.4 (2005).
16. Y.C. Chua, **E. A. DeCuir Jr.**, B.S. Passmore, K. H. Sharif, M. O. Manasreh, Z. Wang, and G. J. Salamo, Tuning In<sub>0.3</sub>Ga<sub>0.7</sub>As/GaAs multiple quantum dots for long-wavelength infrared detectors. *Appl. Phys. Lett.* **85** 1003(2004).

#### MEMBERSHIPS/AWARDS

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Louisiana Engineering Society 2000-2002  
IEEE Member 2001-Present  
National Society of Black Engineers 1999-2002  
Alpha Phi Alpha Fraternity, Inc. 2002-Present  
LSLAMP 2000-2002  
MRS Member 2004-Present  
TOPS Scholarship 1998-2002  
National Dean's List 2001  
Dean's List 1998-2002  
NSF GK-12 Fellowship 2003-2004  
NSF IGERT Fellowship 2004-2006

#### REFERENCES

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