Matthew F. Doty

Assistant Professor
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Research Interests

Design and characterization of novel semiconductor nanostructures, particularly those based on quantum dots. Optical control of confined single charges and spins. Ultrafast optical characterization of material properties. Development of new nanostructured materials for optoelectronic and renewable energy applications.

Education

2004 - 2007	National Research Council Research Associate Naval Research Laboratory
2001 - 2004	Ph.D. in Physics The University of California, Santa Barbara
1998 - 2001	MA in Physics The University of California, Santa Barbara
1994 - 1998	BS in Physics Summa Cum Laude The Pennsylvania State University

Professional Appointments

2012-	Associate Director, UD Nanofabrication Facility
2012-	Assistant Professor of Electrical and Computer Engineering (affiliated appointment) University of Delaware
2012-	Affiliate Faculty, Institute for Energy Conversion University of Delaware
2009-	Assistant Professor of Physics (affiliated appointment) University of Delaware
2007-	Assistant Professor of Materials Science and Engineering University of Delaware

Academic Honors and Awards

Faculty

2012	UD College of Engineering Outstanding Junior Faculty Award
2010	DuPont Young Professor Award
2010	Veeco Research Collaboration Gift
2010	University of Delaware Research Foundation Strategic Initiatives Award
2009	NSF CAREER Award
2008	University of Delaware Research Foundation Award

Student / Postdoc

2007	Winner, Best Paper by a Naval Research Laboratory Post-doc in 2006

2000	University-wide Outstanding Teaching Assistant Award – University of California, Santa Barbara
1999	Outstanding Teaching Assistant Award – UCSB Physics Dept.

Publications

h index per ISI as of June 1, 2012: 10
[#] indicates number of citations per ISI as of June 1, 2012

26. S. E. Economou, J.I. Climente, A. Badolato, A.S. Bracker, D. Gammon, M.F. Doty. *Scalable qubit architecture based on holes in quantum dot molecules*, Phys. Rev. B **86** 085319 (2012) http://dx.doi.org/10.1103/PhysRevB.86.085319

25. M.M. Can, S.I. Shah, M.F. Doty, C.R. Haughn, T. Fırat. *Electrical and optical properties of point defects in ZnO thin films*. Journal of Physics D: Applied Physics. **45** 195104 (2012) [0] http://dx.doi.org/10.1088/0022-3727/45/19/195104

24. D.A. Edwards, W.M. Reid, M.F. Doty. *Wavefunction delocalization in quantum dot arrays: an asymptotic analysis.* Journ. Engr. Mathematics, in press (2012)

23. W.M. Reid, T. Driscoll, M.F. Doty. *Forming delocalized intermediate states with realistic quantum dots.* Journ. Appl. Phys. **111** 056103 (2012) [0] http://dx.doi.org/10.1063/1.3691113

22. X. Zhou, S. Sanwlani, W. Liu, J.H. Lee, Zh. M. Wang, G. Salamo, M.F. Doty. *Spectroscopic signatures of many-body interactions and delocalized states in self-assembled lateral quantum dot molecules.* Phys. Rev. B **84** 205411 (2011) [1]
Editor's Selection
http://link.aps.org/doi/10.1103/PhysRevB.84.205411

21. F. Xu , X. Ma , C. R. Haughn , J. Benavides , M. F. Doty , and S. G. Cloutier. *Efficient Exciton Funnelling in Cascaded PbS Quantum Dot Superstructures.* ACS Nano **5** 9950 (2011) [2] http://dx.doi.org/10.1021/nn203728t

20. W. Liu, S. Sanwlani, R. Hazbun, J. Kolodzey, A.S. Bracker, D. Gammon, M.F. Doty. *In-situ tunable g factor for a single electron confined in an InAs quantum dot molecule.* Phys. Rev. B **84** 121304(R) (2011) [3]
Editor's Suggestion
http://dx/doi.org/10.1103/PhysRevB.84.121304

19. K. Schmieder, C.R. Haughn, Z. Pulwin, D. Dyer, J. Mutitu, M.F. Doty, C. Ebert, A. Barnett. *Analysis of High Growth Rate MOCVD Structures by Solar Cell Device Measurements* Proceedings of 37th IEEE Photovoltaic Specialist Conference 000542 (2011) http://dx/doi.org/10.1109/PVSC.2011.6186013

18. L.E. Cassels, T.E. Buehl, P.G. Burke, C. J. Palmstrom, A.C. Gossard, G. Pernot, A. Shakouri, C.R. Haughn, M.F. Doty, J.M.O. Zide. *Growth and characterization of TbAs:GaAs nanocomposites.* J. Vac. Sci. Technol. B **29** 03C114 (2011) [0]
http://dx.doi.org/10.1116/1.3555388

17. W. Yin, M. Doty, C. Ni, C. Hu, M. Cao, B, Wei. *Vertically Well-aligned In2O3 Cone-like Nanowire arrays grown on Indium substrates.* Eur. Journ. Inorg. Chem. **2011** 1570 (2011) [1]
http://dx.doi.org/10.1002/ejic.201001071

16. J. Planelles*, J.I. Climente, F. Rajadell, M.F. Doty, A.S. Bracker, D. Gammon. *Effect of strain and variable mass on the formation of antibonding hole ground states in InAs quantum dot molecules.* Phys. Rev. B **82** 155307 (2010) [5]
http://dx.doi.org/10.1103/PhysRevB.82.155307

15. M.F. Doty, J.I. Climente, A. Greilich, M. Yakes, A.S. Bracker, D. Gammon. *Oportunities for single hole-spin control using delocalized states of quantum dot molecules.* Journal of Physics: Conference Series **245** 012002 (2010)

14. M.F. Doty, J.I. Climente, A. Greilich, M. Yakes, A.S. Bracker, D. Gammon. *Hole spin mixing in InAs Quantum-Dot molecules.* Phys. Rev. B **81** 035308 (2010) [14]
http://dx.doi.org/10.1103/PhysRevB.81.035308

13. M.F. Doty, J.I. Climente, M. Korkusinski, M. Scheibner, A.S. Bracker, P. Hawrylak, D. Gammon. *Antibonding ground states in InAs Quantum-Dot molecules.* Phys. Rev. Lett., **102** 047401 (2009) [27]
http://dx.doi.org/10.1103/PhysRevLett.102.047401

12. M.F. Doty, M. Scheibner, A.S. Bracker, I.V. Ponomarev, T.L. Reinecke, D. Gammon. *Optical spectra of doubly charged quantum dot molecules in electric and magnetic fields* Phys. Rev. B. **78** 115316 (2008) [20]
http://dx.doi.org/10.1103/PhysRevB.78.115316

Work done prior to start at University of Delaware (Fall 2007)

11. M. Scheibner, M. Yakes, A.S. Bracker, I.V. Ponomarev, M.F. Doty, C.S. Hellberg, L.J. Whitman, T.L. Reinecke, D. Gammon. *Optically mapping the electronic structure of coupled quantum dots.* Nature Physics. **4** 291 (2008) [30]
http://dx.doi.org/10.1038/nphys882

10. M. Scheibner, M.F. Doty, I.V. Ponomarev, A.S. Bracker, E.A. Stinaff, V.L. Korenev, T.L. Reinecke, D. Gammon. *Spin Fine-Structure in Optically Excited Quantum Dot Molecules.* Phys. Rev. B **75**, 245318 (2007) [37]
http://dx.doi.org/10.1103/PhysRevB.75.245318

9. M. Scheibner, I.V. Ponomarev, E.A. Stinaff, M.F. Doty, A.S. Bracker,C.S. Hellberg, T.L. Reinecke, D. Gammon. *Photoluminescence spectroscopy of the molecular biexciton in vertically stacked InAs-GaAs quantum dot pairs.* Phys. Rev. Lett. **99** 197402 (2007) [29] http://dx.doi.org/10.1103/PhysRevLett.99.197402

8. M.F. Doty, M. Scheibner, I.V. Ponomarev, E.A. Stinaff, A.S. Bracker, V.L. Korenev, T.L. Reinecke, D. Gammon. *Electrically tunable g-factors in quantum dot molecular spin states.* Phys. Rev. Lett. **97** 197202 (2006) [52] http://dx.doi.org/10.1103/PhysRevLett.97.197202

7. M.F. Doty, M.E. Ware, E.A. Stinaff, M. Scheibner, A.S. Bracker, I.V. Ponomarev, S.D. Badescu, V.L. Korenev, T.L. Reinecke, D. Gammon. *Spin Interactions in InAs Quantum Dots and Molecules.* Physica Status Solidi (b) **243** 3859 (2006) [1] http://dx.doi.org/10.1002/pssb.200671508

6. A.S. Bracker, M. Scheibner, M.F. Doty, E.A. Stinaff, I.V. Ponomarev, J.C. Kim, L.J. Whitman, T.L. Reinecke, D. Gammon. *Engineering electron and hole tunneling with asymmetric InAs quantum dot molecules.* Appl. Phys. Lett. **89**, 233110 (2006) [59] http://dx.doi.org/10.1063/1.2400397

5. I.V. Ponomarev, M. Scheibner, E.A. Stinaff, A.S. Bracker, M.F. Doty, S.D. Badescu, M.E. Ware, V.L. Korenev, T.L. Reinecke, D. Gammon. *Theory of spin states in coupled quantum dots.* Physica Status Solidi (b) **243** 3869 (2006) [4] http://dx.doi.org/10.1002/pssb.200671510

4. E.A. Stinaff, M. Scheibner, A.S. Bracker, I.V. Ponomarev, V.L. Korenev, M.E. Ware, M.F. Doty, T.L. Reinecke, D. Gammon. *Optical signatures of coupled quantum dots.* Science **311** 636 (2006) [200] http://dx.doi.org/10.1126/science.1121189

3. M.E. Ware, E.A Stinaff, D. Gammon, M.F. Doty, A.S. Bracker, D. Gershoni, V.L. Korenev, S.C. Badescu, Y. Lyanda-Geller, T.L. Reinecke. *Polarized fine structure in the photoluminescence excitation spectrum of a negatively charged quantum dot.* Phys. Rev. Lett. **95** 177403 (2005) [75] http://dx.doi.org/10.1103/PhysRevLett.95.177403

2. M.F. Doty, B.T. King, M.S. Sherwin, C.R. Stanley. *Verification of polarization selection rules and implementation of selective coherent manipulations of hydrogenic transitions in n-GaAs.* Phys. Rev. B **71** 201201 (2005) [6] http://dx.doi.org/10.1103/PhysRevB.71.201201

1. M.F. Doty, B.E. Cole, B.T. King, M.S. Sherwin. *Wavelength-specific laser-activated switches for improved contrast ratio in generation of short THz pulses.* Rev. Sci. Inst. **75** 2921 (2004) [10] http://dx.doi.org/10.1063/1.1783594

Invited Book Chapters as lead author

2. "Holes in Quantum Dot Molecules: Structure, Symmetry, and Spin," Progress in Quantum Dots, edited by Alexander Tartakovskii, in press, 2012
1. "Optical spectroscopy of spin in coupled quantum dots," Single Semiconductor Quantum Dots, edited by Peter Michler, Springer, 2009

Patents

1. M.F. Doty, J.M.O. Zide. "Novel Nanostructures for efficient photon upconversion," Provisional Patent Application filed 5/30/2012

Invited Presentations

26. 2012 Materials Research Society Fall meeting
25. 2012 Intermag (IEEE international conference on magnetics) plenary tutorial
24. 2012 University of Delaware Energy Institute Annual Symposium
23. 2012 Dept. of Physics, University of Maryland
22. 2012 Dept. of Electrical and Computer Engineering, University of Delaware
21. 2012 Dept. of Materials Science, University of Pennsylvania
20. 2011 Dept. of Polymer Science and Engineering, University of Massachusetts, Amherst
19. 2011 Dept. of Physics, Mount Holyoke College
18. 2011 4th US-China workshop on nanostructured materials for global energy
17. 2011 Villa Conference on Interacting Nanostructures
16. 2010 Virtual Conference on Nanoscale Science and Technology, Sydney, Australia
15. 2010 Dept. of Materials Science and Engineering, Rutgers
14. 2009 Dept. of Physical Chemistry, King Jaume I University, Castello, Spain
13. 2009 Workshop on Single Quantum Devices, Stuttgart, Germany
12. 2009 Dept. of Physics, University of Delaware
11. 2009 Dept. of Physics, Millersville University
10. 2009 Dept. of Physics, University of Arkansas
9. 2009 Dept. of Materials Science and Engineering, MIT
8. 2009 NIST Quantum Processes and Metrology Division
7. 2008 Dept. of Physics, University of Massachussetts, Amherst
6. 2008 American Physical Society March Meeting

Presentations prior to start at University of Delaware (Fall 2007)

5. 2007 G.E. Global Research
4. 2007 Dept. of Physics and Astronomy, University of Pittsburgh
3. 2007 Dept. of Physics and Astronomy, Syracuse University
2. 2006 College of Nanoscale Science and Engineering, University of Albany
1. 2000 American Physical Society April Meeting

Funding Summary

- $1,265,758 in individual research support.
- PI or Co-PI on grants or awards totaling $1,744,183.

Post-doctoral Researchers Supervised

2012- Diane Sellers Ph.D Chemistry, U. Buffalo

Doctoral Students

2007-	Weiwen Liu	Materials Science (Expected graduation April 2013)	
2007-2009	Shilpa Sanwlani	Materials Science	Graduated with M.S.
2008-2012	William Reid	Materials Science	Graduated with M.S
2010-	Laura Vanderhoef	Physics	
2009-	Chelsea Haughn	Materials Science	
2009-	Xinran Zhou	Materials Science	
2010-	Anagha Kulkarni	Electrical and Computer Engineering	

Undergraduate Students

2010-2011	Evan Sinicin	Physics, University of Delaware
2011-2012	Dhanunjaya Mantena	Electrical Engineering, University of Delaware
2012-	Alexandra De Palma	Chemistry, Chestnut Hill College

Advisors

Dr. Daniel Gammon	Naval Research Laboratory	Postdoctoral Advisor
Professor Mark Sherwin	University of California, Santa Barbara	Ph.D. Advisor