

ALEX PUNNOOSE

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EDUCATION

1994 Ph. D. (Physics), Aligarh University, India
1990 M. S. (Solid State Physics), Aligarh University, India.
1988 B. S. (Physics), Mahatma Gandhi University, India.

EMPLOYMENT

07/2008 – Present : Professor of Physics, Boise State University.
07/2006 – 07/2008: Associate Professor of Physics, Boise State University.
06/2007 – 08/2007: Visiting Professor of Physics, Indian Institute of Science, Bangalore.
07/2002 – 07/2006: Assistant Professor of Physics, Boise State University.
10/1999 – 07/2002: Postdoctoral associate, West Virginia University (Nanoscale magnetism)
12/1997 – 10/1999: Research associate, Kuwait University (Zn-Cd-Te alloys & solar cells)
11/1994 – 12/1997: Lecturer in Physics, Mahatma Gandhi University, India.
06/1994 – 11/1994: Lecturer in Applied Physics, Aligarh University, India.

GRANTS, AWARDS AND HONORS

- 2007 award for outstanding research in the College of Arts and Science, Boise State University (a college-level award given every two years)
- 2007 award for outstanding teaching in the College of Arts and Science, Boise State University (a college-level award given every two years)
- 2007 Boise State University Foundation award for outstanding research (a university-wide annual competition)
- Finalist, 2007 Boise State University Foundation award for outstanding teaching (a university-wide annual competition)
- Recipient of the 2005 National Science Foundation-CAREER award.
- Finalist in the Early-Stage Innovation of the Year award competition organized by the State of Idaho in 2010 for the research work titled “Novel Nanoparticles That Kill Cancer Cells”.
- Selected as one of the two EPSCoR researchers from Idaho to acknowledge at a luncheon at Capitol Hill, Washington, DC for research excellence during the National EPSCoR/IDeA States Membership Meeting, February 28 - March 1, 2006
- PI or co-PI of 25 grants awarded during 2002-2010, totaling \$8M :

- 2009 Army Research Office – Applied Nanotechnology grant
 - 2008 National Science Foundation – Collaborative research grant.
 - 2008 National Science Foundation-Major Research Instrumentation (FACS) award.
 - 2007 National Science Foundation - Major Research Instrumentation (XPS) award.
 - 2007 Department of Energy-EPSCoR Implementation Grant.
 - 2006 National Science Foundation-REU award.
 - 2005 National Science Foundation-CAREER award.
 - 2005 National Science Foundation-Europe Materials World Network award.
 - 2005 National Science Foundation - Major Research Instrumentation (TEM) award.
 - 2005 COAS Mini grant, Boise State University.
 - 2005 Boise State University - Faculty Research Associates Program award.
 - 2005 Boise State University - Collaborative Grant Improvement Initiative grant.
 - 2005 National Science Foundation -Idaho-EPSCoR RII award.
 - 2004 Petroleum Research Fund AC grant.
 - 2004 Department of Energy-EPSCoR Implementation Grant.
 - 2004 Micron Technology grant: Donation of Research Equipment.
 - 2003 Cottrell College Science Award from Research Corporation.
 - 2003 National Science Foundation - Major Research Instrumentation (EPR) Award.
 - 2003 National Science Foundation -Idaho-EPSCoR Instrumentation (VSM) Award.
 - 2003 Idaho EPSCoR-Collaborative Nano-research award 1.
 - 2003 Idaho EPSCoR-Collaborative Nano-research award 2.
 - 2002 National Science Foundation -EPSCoR Infrastructure Improvement Grant.
- Finalist of the 2003 young scientist award of the International EPR Society for the development of a new research technique-“Hysteretic Ferromagnetic Resonance”.

- Postgraduate merit scholarship from the Faculty of Science, Aligarh University (India) during 1988 – 1990.
- Top rank in M. S in the solid state physics division at Aligarh University (India), 1990.

PROFESSIONAL ACTIVITIES

Scientific Sessions Chaired at International Conferences (After joining Boise State):

1. Invited to chair a session (magnetic semiconductor) in the 54th Annual Conference on Magnetism and Magnetic Materials, Atlanta, January 2010.
2. Session chair (magnetic sensors) in the 51st Annual Conference on Magnetism and Magnetic Materials, Baltimore, MD, January 2007.
3. Session HS - Spin Dependent Tunneling and Transport, 50th Annual Conference on Magnetism and Magnetic Materials, San Jose, CA, October 30 – November 3, 2005. Coordinating the review process of 28 research papers submitted for publication in the special issue of Journal of Applied Physics.
4. Session GS: Magnetic Semiconductor Oxides, 2004 Joint MMM-Intermag conference, January 5-9, 2004, Anaheim, CA. Coordinated the review process of 11 research papers which appeared in the Journal of Applied Physics.
5. Session on Magnetic Materials at the 10th International Conference on Composites/Nano Engineering, July 20-26, 2003, New Orleans.
6. Session FP: Magnetic Tunnel Junctions and Half Metallics, 47th Annual Conference on Magnetism and Magnetic Materials, November 11-15, 2002 Tampa, FL. Coordinated the review process of 19 research papers which appeared in the Journal of Applied Physics.
7. Session on Nanocomposite Materials, 9th International Conference on Composites Engineering, July, 2002, San Diego.

Selected Invited Talks (After joining Boise State):

1. *Oxide Semiconductor Nanostructures*
Department of Physics, Indian Institute of Science, Bangalore, India on June 5, 2003
2. *Dilute Magnetic Semiconductor Nanoparticles*
Chemistry Department, University of Idaho, April 26, 2007.
3. *Carrier controlled ferromagnetism in chromium doped indium oxide thin films – a ferromagnetic semiconductor*, 17th International Conference on Magnetism (ICM) is to be held August 24-27, 2006, in Kyoto, Japan.
4. *Semiconductor Nanoparticles*, International Materials Research Congress (IMRC), Cancun, Mexico, August 21-23, 2006;

5. *Nanoscale Semiconductor Oxides for Multifunctional Device Applications*, International Materials Research Congress (IMRC), August 22-26, 2004, Cancun, Mexico.
6. *EPR Studies of Magnetic Nanoparticles*, 4th Asia-Pacific EPR Symposium during November 22-25, 2004, Bangalore, India.
7. *Development of Novel Spintronics Materials*, Center for Materials for Advanced Technology (c-MAT), Trissur, India, December 3, 2004.
8. *Band Theory and Semiconductor Systems*, National Seminar on Solid State Physics, Uzhavoor, India, November 25-28, 2004.
9. *Room temperature Ferromagnetism in Transition-metal-doped Semiconductors*, 10th International Conference on Composites/Nano Engineering, July, 2003, New Orleans.
10. *Finite Size Effects in CuO Nanoparticles*, 9th International Conference on Composites Engineering, July, 2002, San Diego.
11. *Nanoscale Magnetism*
Indian Institute of Science, Bangalore, India on June 5, 2003
12. *Dilute Magnetic Semiconductors*
Pacific Northwest National Laboratory, August 29, 2003.
13. *Electron Magnetic Resonance in Magnetic Nanoparticles*
31st AMPERE Congress on Magnetic Resonance and Related Phenomena, at Adam Mickiewicz University, Poznan, Poland, July 14-19, 2002.

RESEARCH COLLABORATORS - CO-AUTHORS/CO-PIs

University Level Collaborations

1. Dr. W. B. Knowlton (Electrical Engineering and Materials Science and Engineering):
2. Dr. P. Mullner (Materials Science and Engineering):
3. Dr. B. Kim (Physics)
4. Dr. K. Feris (Biology)
5. Dr. D. Wingett (Biology)
6. Dr. J. Tinker (Biology)
7. Dr. R. Ubic (Materials Science and Engineering):
8. Dr. J. Peloquin (Chemistry)
9. Dr. S. Shadle (Chemistry)
10. Dr. W. Kuang (Electrical Engineering)

State and National level Collaborations

11. Dr. R. Tanguay, Oregon State University.
12. Dr. M. H. Engelhard, Pacific Northwest National Lab.
13. Mr. R. Baldner, Micron Technology, Boise.
14. Dr. J. S. Moodera, Massachusetts Institute of Technology.
15. Dr. L. C. Brunel, National High Magnetic Field Laboratory (NHMFL), Tallahassee.
16. Dr. S. Chambers, Pacific Northwest National Lab.
17. Dr. J. Philip, Catholic University, Washington DC.
18. Dr. V. Gopal, Lawrence Berkeley National Lab.
19. Dr. M. S. Seehra, West Virginia University.
20. Dr. N. C. Giles, West Virginia University, Morgantown, WV.
21. Dr. S. Thevuthasan, Pacific Northwest National Lab.
22. Dr. C. Wang, Pacific Northwest National Lab.
23. Dr. V. Shutthanandan, Pacific Northwest National Lab.
24. Dr. R. Kokadapu, Pacific Northwest National Lab.
25. Dr. G. P. Huffman, University of Kentucky.
26. Dr. D. McIlroy (Physics) and Dr. P. Shapiro (Chemistry), University of Idaho.
27. Dr. D. Gamelin (Chemistry), Dr. K. Krishnan (Materials Science) and Dr. M. Omsted (Physics), University of Washington, Seattle, WA.
28. Dr. R. G. Rodriguez and Dr. J. Pak, Chemistry, Idaho State University.
29. Dr. C. Wai, Chemistry, University of Idaho.

International Collaborations

30. Dr. X. Mathew, Centro de Investigacion en Energia-UNAM, **Mexico**
31. Dr. G. Kostorz and Dr. B. Schönfeld, ETH Zurich, **Switzerland**
32. Dr. S. K. Misra, Physics, Concordia University, Montreal, **Canada**.
33. B. Satpati, Institute of Physics, Bhuvanewar, **India**
34. C. Mejía-García and G. Contreras-Puente, Escuela Superior de Física y Matemáticas, IPN, UPALM, **México**
35. Dr. P. K. Biswas, Central Glass and Ceramic research Institute, Kolkata, **India**.
36. Dr. S. V. Bhat, Department of Physics, Indian Institute of Physics, Bangalore, **India**.

STUDENT ADVISING

Undergraduate students

1. Mr. Michael S. Byrns (Physics): Nov. 2002 - June 2003; Prepared ZnO nanoparticles and completed PHYS 482: Senior Project.

2. Mr. Andrew Wood (Electrical Engineering): January -July, 2003; Prepared nanoparticles of TiO₂ and ZnO; Received *internship at Hewlett-Packard*, Boise.
3. Mr. Thongphanh Panthavady (Physics): June 2003 - January 2004. Investigated ferrihydrite nanoparticles and *published a paper in Physical Review B*. Hired by Sapidyne Inc, Boise and got admitted in Utah medical school.
4. Mr. Jason Hays (Physics); June 2003 – December 2004: Investigated transition-metals-doped ZnO and SnO₂; Completed PHYS 482: Senior Project; *Published 4 research papers* and admitted to graduate school. Won *second prize for best student presentation* at a national level competition held as part of the 26th Annual Symposium on Applied Surface Analysis, Richland, WA, June, 2004 and the *2004 Undergraduate Research and Creative Activity Award* from Boise State University.
5. Mr. Aaron Thurber (Physics); June, 2004 – July 2006: Worked on Fe doped SnO₂, *published 3 research papers in journals*. Selected for a paper presentation at the National EPSCoR Research Conference, September 2005 to be held at Puerto Rico. Got admitted to graduate school.
6. Ms. Prabha Malamakkal (Biology); June – August 2006; Worked on the interactions of nanoparticles with bacteria;
7. Ms. Jill West (Physics); December 2005 – present; Working on Fe and Sb doped SnO₂ nanoparticles; *A research paper* is being written up with Jill as a co-author; presented papers in three meetings.
8. Mr. Chadd Vankomen (Physics); May 2005 – present; Working on transition metal doped ZnS and SnO₂.
9. Mr. Sean Stephens (Physics): September – December 2006; Worked on nanoparticle synthesis.
10. Mr. Isaac Coombs (Physics): September 2006 – present; Working on nanoparticle synthesis.
11. Mr. Jason Bell (Biology): December 2006 – present; Investigating the toxicity of nanoparticles to biological systems.
12. Mr. Robert Ormond (Biology): March 2007 – present; Nanosynthesis.
13. Mr. Andrew Coombs (Physics): May 2007 – present; Nanosynthesis.
14. Mr. Geoffrey L. Beausoleil II (Physics) – January 2010 – present: Synthesis of Ni and Co doped CeO₂.
15. Mr. Gordon A. Alanko (Physics) - January 2010 – present: Size-controlled SnO₂ nanoparticle synthesis.
16. Mr. Joshua J. Anghel (Physics) – June 2008 – present: Working on semiconductor thin films and CuO nanoparticles.

Graduate Students:

1. Mr. Jason Hays (Materials Science and Engineering); August, 2005 – May 2007; Topic: Transition-metals-doped semiconductor oxide powders and thin films. *Published 11 research papers* including 4 during his undergraduate period. Thesis committee chair: A. Punnoose.
2. Mr. Aaron Thurber (Materials Science and Engineering); August, 2006 – present; Topic: Magnetic semiconductors; Thesis committee chair: A. Punnoose.
3. Mr. Russell Benson (electrical engineering); August, 2004 – December 2006; Topic: Preparation and characterization of Cr doped ZnO thin films using a sputter deposition system (in collaboration with Dr. W. B. Knowlton). Thesis committee chair: Dr. W. B. Knowlton.
4. Mr. Robert Hanson (electrical engineering); August, 2004 – December 2006; Topic: Fabrication of ZnO thin films (in collaboration with Dr. W. B. Knowlton). Thesis committee chair: Dr. W. B. Knowlton.
5. Mr. Markus Chmielus (Materials Science and Engineering); August, 2006 – present; Topic: Magnetic Shape Memory Alloys (in collaboration with Dr. P. Mullner and Dr. W. B. Knowlton). Thesis committee chair: Dr. P. Mullner.
6. Mr. Dave Carpenter (Materials Science and Engineering); August, 2006 – present; Topic: Magnetic Shape Memory Alloys (in collaboration with Dr. P. Mullner). Thesis committee chair: Dr. P. Mullner.
7. Ms. Cory Hanley (Biology); August, 2006 – present; Topic: Nanoparticle toxicity (in collaboration with Dr. Denise Wingett and Dr. Kevin Feris). Thesis committee chair: Dr. D. Wingett.
8. Ms. Lydia Johnson (Materials Science and Engineering); 2008-present; Topic: Synthesis and applications of ZnO nanoparticles; Thesis committee chair: Drs. A. Punnoose/D. Tenne.

Postdoctoral Fellows:

1. Dr. K. M. Reddy, Ph. D (Indian Institute of Chemical Technology, Hyderabad, India); Jan. 2004 – October 2008.
2. Dr. Hua Wang, Ph. D (State Key Laboratory for Chemo/Biosensing and Chemometrics, Hunan University, China) October; 2006 - October, 2007.
3. Dr. Jianhui Zhang, Ph. D., (Associate Professor, National Laboratory of Solid State Microstructures, Department of Physics, Nanjing University, China), August 2008-August 2010.

ACADEMIC SERVICE

Department of Physics:

- Member, Departmental Tenure Committee (review of tenure progress of Assistant Professors), 2006-present
- Member, Biophysics Faculty Search Committee, 2007.
- Chair, Biophysics Faculty Search Committee, 2006.
- Chair, Nanophysics Faculty Search Committee, 2006.
- Member, Biophysics Faculty Search Committee, 2004.
- Long-Term Planning Committee, 2002-present.
- Physics Internship Coordinator, College of Arts and Sciences, 2003-present.
- Library coordinator, 2005 – 2006.
- Departmental Mini Research Grants Coordinator, 2005 – 2006
- Member of Physics Faculty Search Committee , 2010-2011
- Member of Physics Curriculum Revision Committee.
- Member of Physics Program Review Committee (review and planning of Physics program)

College of Arts and Science:

- Member, Dean Search Committee, 2006.
- Awards and Honors Committee, 2002-2003.
- Awards and Honors Committee, 2004-2005.
- S/N Fourth Floor Lab Renovation Committee, 2002 - 2004.
- MP 302 Lab Renovation Committee, 2003 - 2004.
- S/N 165 Lab Renovation Committee, 2003 - 2004.
- MP 309 Lab Renovation Committee, 2004 - 2005.

University:

- Intellectual Property and Patent Committee, August 2002 - 2008
- Member, Interdisciplinary Materials Science and Engineering Ph. D program working group (5 members) to develop curriculum and notice of intent.
- Environmental Health and Safety Committee, 2005 – present.
- Faculty Research Advisory Committee, 2005 – 2006.
- Member, TEM (Materials Science) faculty search committee, 2006.
- Member of the Interdisciplinary Faculty Oversight Committee which launched the interdisciplinary Materials Science and Engineering (MS&E) graduate program at Boise State University. Involved in the curriculum development, 2002 - present
- Member of the university wide committees (Biophysics and Biomaterials research emphases) for the proposed PhD program in Biomolecular Science, 2005.

- Electrical and Computer Engineering PhD Program support faculty group.
- Member of the graduate thesis committee of Russell Benson (electrical engineering), Robert Hanson (electrical engineering), Markus Chmielus (Materials Science and Engineering); Dave Carpenter (Materials Science and Engineering); and Cory Hanley (Biology);
- Chair of the graduate thesis committee of Jason Hays (Materials Science and Engineering) 2004-2007
- Chair of the graduate thesis committee of Aaron Thurber (Materials Science and Engineering) 2006-2008.
- Chair of the graduate thesis committee of Ms. Lydia Johnson (Materials Science and Engineering); 2008 -present
- Boise State University Speaker's Bureau.

SERVICE TO THE SCIENTIFIC COMMUNITY

- Member of the International Organizing Committee of the International Symposium on Solar Cells & Solar Energy Materials, Cancun, Mexico, 2003-2006.
- Member of the International Scientific Committee of the International Conference on Composites/Nano Engineering (ICCE) 2003-2006.
- Technical Advisory Board member of Computational Mechanisms Inc., an Information Technology based company located in Santa Clara, CA.
- Expert Faculty of the International School on EPR Spectroscopy and Free Radical Research, November 17-20, 2004, Mumbai, India.
- Proposed external examiner for the Ph. D theses of two students from Andhra University and Pondichery Univeristy in India.
- Reviewer – Applied Physics Letters, Nature Materials, Physical Review B, Langmuir, Chemistry of Materials and Journal of Applied Physics.
- Proposal reviewer – National Science Foundation, Research Corporation and Petroleum Research Fund.
- Member, American Physical Society (APS)
- Member, International ESR/EPR Society (IES)
- Member, Asia-Pacific ESR/EPR Society (APES)

RESEARCH AREAS

My major research areas include nanotechnology, nanomedicine, nanoparticles-based cancer and antibacterial therapies, spintronics, nanotoxicology, nanosensors, catalysis, photonics, and nano-biotechnology. I am researching ways to make semiconductor devices smaller (nanotechnology), more effective by making use of the magnetic behavior of

electrons (spintronics) and by manipulating the optical properties of materials (photonics), and by investigating the interactions of the high surface area nanoparticles with gaseous/chemical environments (nanosensors; catalysis) and with biological systems including eukaryotic and prokaryotic cells (nano-biotechnology). Our research demonstrated that carefully designed nanoparticles can selectively kill cancer cells and harmful bacteria without harming the normal healthy cells. All of my research areas are at the intersection of physics, chemistry, materials science, biology, medicine and engineering. Research in these areas requires collaboration with experts in all these disciplines and such interaction enriches the research environment. In addition, based on my expertise in materials characterization, magnetism, nanomaterials and catalysis, I collaborate with several research groups to provide them analytical help in their investigations. I prefer a research group that is an ideal mixture of graduate and undergraduate students, and postdoctoral fellows. This ensures a high level of both learning and discovery.

TEACHING EXPERIENCE

- PHYS 111 General Physics Lab
- PHYS 112 General Physics Lab
- PHYS 309 Introductory Modern Physics with Applications
- PHYS 310 Introductory Modern Physics Lab
- PHYS 482 Senior Project
- PHYS 515 Solid State Physics (graduate level)
- PHYS 522 Advanced Topics: Solid State Physics (graduate level)
- PHYS 523 Physical Methods of Materials Characterization (graduate level)
- PHYS 696 Directed Research (graduate level)
- PHYS 593 Thesis

REFEREED PUBLICATIONS

(** indicates undergraduate students, * indicates graduate students)

Manuscripts under review

1. Occurrence, origin and control of electron-mediated ferromagnetism in transition metal doped tin dioxide nanoparticles, A. Punnoose, A. Thurber, M. H. Engelhard, C. Van Komen, M. S. Seehra, V. Shuthanandan, R. Kukudapu, C. Wang, S. Thevuthasan, K. V. Raman, J. Philip and J. S. Moodera, *Physical Review B* (submitted 2010).
2. Improving the selective cancer killing ability of ZnO nanoparticles using Fe doping, Aaron Thurber, Denise G. Wingett, John W. Rasmussen, Janet Layne*, Lydia Johnson*, Dmitri A. Tenne, Jianhui Zhang, Charles B. Hanna, and Alex Punnoose, *Nanotoxicology* (Submitted 2010)
3. An EPR study of CeO₂ nanoparticles: Effect of doping with 5% Co or Ni ions and varying annealing temperature, S. K. Misra, S. I. Andronenko, J. D. Harris, A. Thurber, G. L. Beausoleil II** and A. Punnoose, *Journal of Applied Physics* (in press, 2010).
4. An Fe³⁺ EPR Study of Nanoparticles of Magnetic Semiconductor Zn_{1-x}Fe_xO, Sushil K. Misra, S. I. Andronenko, L. Johnson*, A. Thurber, and A. Punnoose, *Journal of Applied Physics* (submitted, 2010).
5. Effect of preparation temperature on the physical properties and magnetism of Co doped ZnO nanoparticles, J. Hays, A. Thurber and A. Punnoose, *Magnetism and Magnetic Materials* (submitted, 2010)

Published or Accepted Papers

2010

6. Enhanced Dye Fluorescence in novel Dye-ZnO nano-composites. Jianhui Zhang, Aaron Thurber, Dmitri Tenne, Denise Wingett, Charles Hanna, and Alex Punnoose, *Advanced Functional Materials* (in press, 2010).
7. Magnetism of ZnO Nanoparticles: Dependence on crystallite size and surfactant coating, Aaron P. Thurber, Geoffrey L. Beausoleil II**, Gordon A. Alanko**, Joshua J. Anghel**, Michael S. Jones**, Lydia M. Johnson*, Jianhui Zhang, C. B. Hanna, D. A. Tenne, and Alex Punnoose, *Journal of Applied Physics* (in press, 2010).

8. A High Yield Synthesis of Chalcopyrite CuInS₂ Nanoparticles with Exceptional Size Control, Chivin Sun, Joseph S. Gardner**, Endrit Shurdha*, Kelsey R. Margulieux**, Richard D. Westover*, Lisa Lau*, Gary Long**, Cyril Bajracharya*, C. M. Wang, Aaron Thurber, A. Punnoose, Rene G. Rodriguez and Joshua J. Pak, *Journal of Nanomaterials* vol. 2009, Article ID 748567, 7 pages, (2010).
9. Transition metal dopants essential for producing ferromagnetism in metal oxide nanoparticles, Lydia Johnson, Aaron Thurber, Josh Anghel**, Maryam Sabetian**, Mark H. Engelhard, D. Tenne, Charles Hanna and Alex Punnoose, *Physical Review B* 82, 054419 (2010).
10. Highly shape-selective synthesis, silica coating, self-assembly, and magnetic hydrogen sensing of hematite nanoparticles, Jianhui Zhang, Aaron Thurber, Charles Hanna and Alex Punnoose, *Langmuir* (in press, 2010).
11. Correlation between saturation magnetization, bandgap and lattice volume of transition metal (M = Cr, Mn, Fe, Co or Ni) doped Zn_{1-x}M_xO nanoparticles; J. Anghel**, A. Thurber, D. Tenne, C. B. Hanna, A. Punnoose, *Journal of Applied Physics* 107, 09E314 (2010).
12. Electrostatic interactions affect nanoparticle-mediated toxicity to the Gram-negative bacterium *Pseudomonas aeruginosa* PAO1. Kevin Feris, Caitlin Otto**, Juliette Tinker, Denise Wingett, Alex Punnoose, Aaron Thurber, Madhu Kongara, Maryam Sabetian**, Bonnie Quinn, Charles Hanna, David Pink, *Langmuir* **2010**, 26 (6), pp 4429–4436

2009

13. A 236-GHz Fe³⁺ EPR study of nano-particles of the ferro-magnetic room-temperature semiconductor Sn_{1-x}Fe_xO₂ (x=0.005), Sushil K. Misra, S. I. Andronenko, A. Punnoose, Dmitry Tipikin* and J. H. Freed, *Applied Magnetic Resonance*, Volume 36, Issue 2, Page 291. (2009)
14. The influences of cell type and ZnO nanoparticle size on immune cell cytotoxicity and cytokine induction. C. Hanley*, A. Thurber, C. Hanna, A. Punnoose, J. Zhang and D. Wingett, *Nanoscale Research Letters*, Vol. 4, 1409-1420 (2009).
15. Formation of an unusual copper(II) complex from the degradation of a novel tricopper(II) carbohydrazone complex. E. Manoj*, M. R. Prathapachandra Kurup, R. P. John, M. Nethaji and A. Punnoose, *Inorganic Chemistry Communications* 12, 952 (2009).
16. Influence of oxygen level on structure and ferromagnetism in Sn_{0.95}Fe_{0.05}O₂ nanoparticles. A. Thurber, K. M. Reddy and A. Punnoose, *Journal of Applied Physics*, 105, 07E706 (2009).

17. Dopant Spin States and Magnetic Interactions in Transition Metal Doped Semiconductor Nanoparticles. A. Punnoose, K. M. Reddy, J. Hays, A. Thurber, S. Andronenko and S. K. Misra, *Applied Magnetic Resonance*, Vol. 36, pages 331-345 (2009).
18. Cr³⁺ electron paramagnetic resonance study of Sn_{1-x}Cr_xO₂ (0.00 ≤ x ≤ 0.01). S. K. Misra, S. I. Andronenko, S. Rao*, S. V. Bhat, C. Van Komen** and A. Punnoose, *Journal of Applied Physics*, 105, 07C514 (2009).
19. Preparation, magnetic and EPR spectral studies of copper(II) complexes of an anticancer drug analogue, E. Manoj*, M.R. Prathapachandra Kurup, and Alex Punnoose, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 72, 474-483, (2009).
20. Fluorescent dye encapsulated ZnO particles with cell-specific toxicity for potential use in biomedical applications. H. Wang, D. Wingett, M. H. Engelhard, K. Feris, K. M. Reddy, P. Turner**, J. Layne*, C. Hanley*, J. Bell**, D. Tenne, C. Wang and A. Punnoose, *J. Materials Science: Materials in Medicine*, 20, 11-22 (2009).
21. Ferromagnetic resonance properties and anisotropy of Ni-Mn-Ga thin films of different thicknesses deposited on Si substrate; Vladimir Golub, K. M. Reddy, Volodymyr Chernenko, Peter Mullner, Alex Punnoose, and Makoto Ohtsuka, *Journal of Applied Physics*, 105, 07A942 (2009).
22. Transition from n-type to p-type destroys ferromagnetism in semi-conducting Sn_{1-x}Co_xO₂ and Sn_{1-x}Cr_xO₂ nanoparticles. C. Van Komen**, A. Punnoose and M. S. Seehra. *Solid State Communications* 149, 2257 (2009).

2008

23. Preferential killing of cancer cells and activated human T cells using ZnO nanoparticles. C. Hanley*, J. Layne*, A. Punnoose, K. M. Reddy, I. Coombs**, A. Coombs**, K. Feris and D. Wingett. *Nanotechnology* 19, 295103 (2008).
24. Role of dopant incorporation on the magnetic properties of Ce_{1-x}Ni_xO₂ nanoparticles: An electron paramagnetic resonance study. S. K. Misra, S. I. Andronenko, M. H. Engelhard, A. Thurber, K. M. Reddy and A. Punnoose. *J. Appl. Phys.* 103, 07D122 (2008).
25. Structure-magnetic property relationship in transition metal (M = V, Cr, Mn, Fe, Co, Ni) doped SnO₂ nanoparticles. C. Van Komen**, A. Thurber, K. M. Reddy, J. Hays* and A. Punnoose. *J. Appl. Phys.* 103, 07D141 (2008).

2007

26. “Selective toxicity of zinc oxide nanoparticles to prokaryotic and eukaryotic systems” K. M. Reddy, K. Feris, Jason Bell**, Denise G. Wingett, Cory Hanley*, and Alex Punnoose, *Applied Physics Letters*, 90, 213902 (2007).
27. “Novel magnetic hydrogen sensing: A case study using antiferromagnetic hematite nanoparticles” A. Punnoose, K. M. Reddy, M. H. Engelhard, J. Hays* and A. Thurber**, *Nanotechnology*, 18, 165502 (2007).
28. “Ferromagnetism in chemically synthesized CeO₂ nanoparticles by Ni doping” A. Thurber*, K. M. Reddy, V. Shutthanandan, M. H. Engelhard, C. Wang, J. Hays* and A. Punnoose, *Physical Review B* **76**, 165206 (2007).
29. “Self-assembled macrocyclic molecular squares of Ni (II) derived from carbohydrazones and thiocarbohydrazones: Structural and magnetic studies”, E. Manoj*, M. R. Prathapachandra Kurup, H. –K. Fun and A. Punnoose, *Polyhedron* **26**, 4451 (2007).
30. “Effect of Co Doping on the Structural, Optical and Magnetic Properties of ZnO” J. Hays*, K. M. Reddy, N. Graces, M. H. Engelhard, V. Shutthanandan, N. Giles, C. Wang, S. Thevuthasan and A. Punnoose, *J. Phys: Condens. Matter*, 19, 266203 (2007).
31. “On the Room Temperature Ferromagnetism of Zn_{1-x}Cr_xO Thin films Deposited by Reactive Co-sputtering”, K. M. Reddy, R. Benson*, R. Hansen*, J. Hays*, A. Thurber**, M. H. Engelhard, V. Shutthanandan, S. Thevuthasan, W. B. Knowlton and A. Punnoose, *Solar Energy Materials and Solar Cells*, 91, 1496 (2007).
32. “Magnetic properties of Chemically Synthesized Transparent Mn Doped ITO films”, K. M. Reddy, J. Hays*, S. Kundu, L. K. Dua, P. K. Biswas, C. Wang, V. Shutthanandan, M. H. Engelhard and A. Punnoose, *Journal of Materials Science: Materials in Electronics*, 18, 1197 (2007).
33. “On the Occurrence and Stability of Ferromagnetism in Chemically Synthesized Cobalt doped TiO₂”, K. M. Reddy and A. Punnoose, *Journal of Materials Science: Materials in Electronics*, 18, 1137 (2007).
34. “Effect of Fluorine Doping on the Ferromagnetic Properties of Sn_{0.95}Fe_{0.05}O₂”, A. Thurber**, J. Hays*, K. M. Reddy, and A. Punnoose, *Journal of Materials Science: Materials in Electronics*, 18, 1151 (2007).
35. “Mapping ferromagnetism in Ti_{1-x}Co_xO₂ – Role of preparation temperature (200 – 900°C) and doping concentration (0.00015 < x < 0.1)”; K. M. Reddy and A. Punnoose, *Journal of Applied Physics*, **101** 09H112 (2007).
36. “High-temperature field-induced activation of ferromagnetism in Ce_{1-x}Ni_xO₂”; Aaron Thurber**, K. M. Reddy and Alex Punnoose; *Journal of Applied Physics* **101** 09N506 (2007).
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Patents

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CONFERENCE PRESENTATIONS

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1. Synthesis and Characterization of Transition Metal-doped ZnO; Lytia A. Smith**, Theron R. Fereday**, Jerry D. Harris, Jason Brotherton**, Aaron Thurber, William B. Knowlton, Alex Punnoose and Brian J. Frost, poster presentation at the Spring 2010 National Meeting of the American Chemical Society (San Francisco, California, March 21 - 25, **2010**).
2. Magnetism of ZnO Nanoparticles: Dependence on crystallite size and surfactant coating ,Aaron P. Thurber, Geoffrey L. Beausoleil II**, Gordon A. Alanko**, Joshua J. Anghel**, Michael S. Jones**, Lydia M. Johnson*, Jianhui Zhang, C. B. Hanna, D. A. Tenne, and Alex Punnoose, 55th Magnetism and Magnetic Materials conference (AIP) in Atlanta, November **2010**.
3. An EPR study of CeO₂ nanoparticles: Effect of doping with 5% Co or Ni ions and varying annealing temperature, S. K. Misra, S. I. Andronenko, J. D.Harris, A. Thurber, G. L. Beausoleil II** and A. Punnoose, 55th Magnetism and Magnetic Materials conference (AIP) in Atlanta, November **2010**.
4. Synthesis and Characterization of ZnO Sol-gel Powders; Amanda R. Snyder**, Lytia A. Smith**, Theron R. Fereday**, Jerry D. Harris, Aaron Thurber, Jason Brotherton, Pamela Walker, William B. Knowlton, and Alex Punnoose, poster presentation at the Spring 2010 National Meeting of the American Chemical Society (San Francisco, California, March 21 - 25, **2010**).
5. Growth and Characterization of ZnO Thin Films; Theron Fereday**, Lytia Smith**, Amanda Snyder**, Jerry D. Harris, Aaron Thurber, Jason Brotherton**, William B. Knowlton, Alex Punnoose, Seth M. Hubbard, and Brian J. Frost, poster presentation at the Spring 2010 National Meeting of the American Chemical Society (San Francisco, California, March 21 - 25, **2010**).
6. An Fe³⁺ EPR Study of Nanoparticles of Magnetic Semiconductor Zn_{1-x}Fe_xO, Sushil K. Misra, S. I. Andronenko, L. Johnson, A. Thurber, and A. Punnoose, 11th joint Intermag-MMM conference, January 11-18, Washington DC, **2009**.

7. Correlation between saturation magnetization, bandgap and lattice volume of transition metal (M = Cr, Mn, Fe, Co or Ni) doped Zn_{1-x}M_xO nanoparticles for x = 0.02 and 0.05; J. Anghel, A. Thurber, D. Tenne, C. B. Hanna, A. Punnoose, 11th joint Intermag-MMM conference, January 11-18, Washington DC, **2009**.
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11. High sensitivity magnetic gas sensing using magnetic semiconductor nanoparticles. A. Thurber, A. Punnoose and K.M. Reddy, 53rd Magnetism and Magnetic Materials conference (AIP) in Austin, TX November **2008**:
12. Transition from n-type to p-type destroys ferromagnetism in semiconducting Sn_{1-x}CoxO₂ and Sn_{1-x}Cr_xO₂ nanoparticles. C.B. Van Komen, M.S. Seehra and A. Punnoose, Physics, Boise State University, Boise, ID; 53rd Magnetism and Magnetic Materials conference (AIP) in Austin, TX November **2008**:
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 22. K. M. Reddy, R. Benson*, J. Hays*, A. Thurber**, M. H. Engelhard, V. Shutthanandan, R. Hanson*, W. B. Knowlton, and A. Punnoose, “ $Zn_{1-x}Cr_xO$ Thin Films Deposited by Reactive Co-sputtering”, DoE EPSCoR Annual Statewide Meeting, Pocatello, September 18-20, **2006**.
 23. Aaron Thurber**, J. Hays*, K. M. Reddy, and A. Punnoose, “Effects of Transition-Metal Doping on Ferromagnetic Metal Oxide Nanoparticles”, Boise State Day Undergraduate Student Research Presentations, January 15, **2006**, Boise, Idaho.
 24. A. Punnoose, “Nanoscale Semiconductor Oxides (Invited)”, International Materials Research Congress (IMRC), Cancun, Mexico, August 21-24, **2006**.
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44. A. Punnoose, "Band Theory Applied to Novel Semiconductor Materials (Invited)", National Seminar on Solid State Physics, Uzhavoor, India, November 25-28, **2004**.
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47. A. Punnoose and J. Hays**, "Possible Metamagnetic Origin of Ferromagnetism in Transition-Metal-Doped SnO_2 " 49th Annual Conf. on Magn. Mater., Jacksonville, FL, Nov. 7 – 11, **2004**.
48. J. Hays** and A. Punnoose, "Tailoring the Physical Properties of Semiconductors Through Fe Doping", *Undergraduate Research and Professional Practice Conference*, Boise State University, April 19, **2004**, Boise, Idaho.
49. J. Hays** and A. Punnoose, "New Magnetic Semiconductors for Spintronic Applications", Boise State Day Undergraduate Student Research Presentations January 21, **2004**, Boise, Idaho.
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