

## **George S. Nolas, Ph.D.**

Associate Professor of Physics

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### **Background**

- 2005-present **Associate Professor**, Department of Physics, University of South Florida  
2001-2005 **Assistant Professor**, Department of Physics, University of South Florida  
1998-2001 **Adjunct Professor**, Department of Physics and Astronomy, Clemson University  
1998-2001 **Senior Member of the Technical Staff**, Marlow Industries, Inc., Dallas, Texas  
1996-1998 **Member of the Technical Staff**, Marlow Industries, Inc., Dallas, Texas  
1994-1996 **Postdoctoral Research Associate**, Dept. of Physics, Rensselaer Polytechnic Institute (Advisor: Glen A. Slack)  
1987-1988 **Instructor** of Electronics & Computer Sci., SCS Tech Institute, New York, NY  
**Earned New York State teaching license**

### **Education**

- Ph.D. Physics, May 1994, Stevens Institute of Technology (Advisor: Swapan Gayen)  
(Thesis: Electronic Raman Scattering Study of Trivalent Cerium in Yttrium Oxide and related complexes.)  
M.S. Physics, May 1986, New York University (Advisor: H. Henry Stokes)  
(Thesis: Oscillations in Glow Discharges)  
B.A. Physics, August 1984, Queens College of the City University of New York

### **Honors and Awards**

- 2007 Jerome Krivanek Distinguished Teacher Award  
2005-2008 International Thermoelectric Society Board of Directors, elected  
2005 University of South Florida Undergraduate Teaching Award  
1993-2006 Organized several symposia and given numerous seminars (to industry and academic institutions nationally and abroad) and invited conference presentations  
2001-present Three U.S. patents issued with two more pending  
2002 University of South Florida Presidential Young Faculty Award  
2002 Member of the Advisory Committee; Thermoelectrics Workshop, Traverse City, Michigan  
1999-2002 International Thermoelectric Society Board of Directors, elected  
1998 Promoted to Senior Member of the Technical Staff, Marlow Industries, Inc.  
1994 Graduate Research Award, Stevens Institute of Technology  
1988 Robert Crooks Stanley Graduate Fellowship, Stevens Institute of Technology  
1986 James Arthur Scholarship, New York University  
1986 New York University Scholarship, New York University  
1981 Mayor's Scholarship, Queens College of CUNY

**Grant Awards:** A total of \$ 2,233,942 in research funding awarded as *Principle Investigator on peer-reviewed Federal grants* (\$ 2,328,592 of total funding).

**Publications:** Three U.S. patents (plus two pending); one book (the foremost text in the field); 4 edited volumes; 8 review articles; 61 journal articles; 54 conference proceeding

**Invited Presentations:** Numerous Plenary & Invited to Conferences, Seminars and Colloquia

**Mentor:** Currently mentoring 3 PhD students and one postdoctoral research associate.  
Also a mentor to a junior faculty member in the USF College of Arts & Sciences.

### **Symposia and Conference Organization**

2006 Materials Science and Technology Session Organizer  
2000, 2001, 2003 and 2005 Materials Research Society (MRS) Symposium Organizer  
2005 Treasurer, International Thermoelectrics Conference  
2001 & 2004 American Physical Society (APS) Forum on Industrial and Applied Physics (FIAP)  
Focus Session Organizer  
2002 & 2003 APS FIAP and Division of Materials Physics (DMP) Focus Session Organizer  
2001, 2002, 2003 & 2004 APS session chair  
2003 Electrochemical Society (ECS) Symposium Organizer and session chair  
1998, 1999, 2000, 2001, 2002, 2004 & 2005 International Thermoelectrics Conf session chair  
1997, 1998, 2000 (Spring & Fall), 2001, 2003 & 2005 MRS session chair

### **Professional Affiliations**

American Ceramics Society (ACerS)  
American Chemical Society (ACS)  
American Physical Society (APS)  
International Thermoelectrics Society (ITS) - elected board member  
Materials Research Society (MRS)  
SIGMA XI

### **Patents (three issued, two pending)**

- S. Witanachchi, L. Woods, **G.S. Nolas** and P. Mukherjee, “A Novel nano-structured material system with high thermoelectric figure-of-merit”, provisional patent submitted.
- **G.S. Nolas**, S. Witanachchi and P. Mukherjee, “Clathrate Compounds for Electronic Applications”, Patent Pending, 60/728,505, filed October 20, 2005.
- **G.S. Nolas**, “Semiconductor Materials with Partially Filled Skutterudite Crystal Lattice Structures optimized for Selected Thermoelectric Properties and Methods of Preparation”, US Patent 6,369,314, April 9, 2002.
- **G.S. Nolas**, “Semiconductor Materials with Skutterudite Type Crystal Lattice Structures Optimized for Selected Thermoelectric Properties and Methods of Preparation”, US Patent 6,207,888, March 27, 2001.
- **G.S. Nolas** and G.A. Slack, “Thermoelectric Materials Fabricated from Clathrate Compounds and other Materials which form an Inclusion Complex and Method for Optimizing Selected Thermoelectric Properties”, US Patent 6,188,011, February 13, 2001.

## Grant Awards

***A total of \$2,328,592 of research funding has been received as Principle Investigator, of which \$2,233,942 is peer-reviewed Federal grant support.***

1. G.S. Nolas (PI of USF component of Interdisciplinary DOE program), “Develop Thermoelectric Technology for Automotive Waste Heat Recovery”, Department of Energy, \$552,078, 5/1/05-4/30/10.
2. G.S. Nolas (PI), S. Witanachchi (Co-PI) and P. Mukherjee (Co-PI), “A fundamental study of bulk and thin film type II clathrate materials”, Department of Energy, \$495,457, 6/15/04 – 6/14/08.
3. G.S. Nolas (PI), “Thermoelectric type II clathrates”, Office of Naval Research, \$311,772, 4/01/04 – 3/31/06.
4. G.S. Nolas (PI on subcontract), “Silicon clathrates and alloys for high temperature thermoelectric applications”, National Aeronautics and Space Administration, \$40,135, 4/2/04 – 12/31/04.
5. G.S. Nolas (PI), S. Sadow (Co-PI) and J. Wolan (Co-PI), “Si and Si-C clathrates: Scientifically interesting materials with technological importance for United States power generation”, USF Interdisciplinary Research Development Grant, \$50,000, 5/1/03 – 4/30/05.
6. G.S. Nolas (PI), “Structure-property relationships of novel skutterudite compounds  $\text{Ln}_x\text{Co}_4\text{A}_6\text{B}_6$ ”, Petroleum Research Fund, \$35,000, 8/01/02 – 7/31/04.
7. G.S. Nolas (PI), “New Directions in Thermoelectric Materials Research”, USF Faculty International Travel Grant, \$2,150.
8. G.S. Nolas (PI), “Type II clathrates: Novel semiconductor materials for thermoelectric applications”, USF Research and Creative Scholarship Grant, \$7,500. 5/1/02 – 4/31/03.
9. G.S. Nolas (PI), “Filled skutterudites: Potential for thermoelectric cooling applications”, Army Research Laboratory SBIR Phase II, \$735,000, 11/1/99 – 1/31/01.
10. G.S. Nolas (PI), “Filled skutterudites: Potential for thermoelectric cooling applications”, Army Research Laboratory SBIR Phase I, \$99,500, 11/1/98 – 9/31/99.

**Graduate and *undergraduate* students have published their work in refereed publications (journal articles and conference proceedings) and have won poster and oral presentation awards at national conferences, as well as an University of South Florida Thesis Award.**

***University of South Florida Outstanding Thesis Award, 2006/2007:***

Mathew Beekman

***Best Student Paper Award, Electronics Division of the American Ceramics Society, 204th Meeting of the Electrochemical Society***

“Transport and optical properties of the type II clathrates  $\text{Cs}_8\text{Na}_{16}\text{Si}_{136}$  and  $\text{Si}_{136}$ ”

M. Beekman, G.S. Nolas, J. Gryko, G.A. Lamberton, Jr., T.M. Tritt, and C.A. Kendziora;

Proceedings of the 204th Meeting of the Electrochemical Society (2004).

*Student Awards* (students underlined)

***Student Poster Award, Symposium S, Materials Research Society Fall Meeting, Boston, 2003***

“ $\text{CoGe}_{1.5}\text{Se}_{1.5}$ : Synthesis and Characterization”

R. Ertenberg, M. Beekman, J. Martin, G. Fowler, and G.S. Nolas, *Mat. Res. Soc. Sym. Proc.* **793**, 239 (2004).

**Students that have completed research in my laboratory:**

1. Matthew Beekman, M.S. (‘Synthesis and Characterization of Type II Silicon and Germanium Clathrates’) 2006
2. Joshua Martin, M.S. (‘Optimization study of Ba-filled Si-Ge alloy type I semiconducting clathrates for thermoelectric application’) 2005
3. Grant Fowler, M.S. (‘Assessing the role of filler atoms in skutterudites and synthesis and characterization of new filled skutterudites’)
4. Holly Rubin, M.S. (‘Transport properties of single-crystal type-I clathrates’)
5. Randolph Ertenberg, M.S. (‘ $\text{CoGe}_{1.5}\text{Se}_{1.5}$ : Structural and transport characterization’) 2003
6. Peter Bumpus, B.S. Physics (UG Res.: ‘Wet Synthesis of PbTe Nanoparticles’) 2006
7. Sarah Erickson, B.S. Physics (UG Res./Honor’s College Thesis: ‘Optimization of the thermoelectric properties of type I clathrates  $\text{Ba}_8\text{Ga}_{16}\text{Si}_{30}$  and  $\text{Ba}_8\text{Ga}_{16}\text{Ge}_{30}$ ’) 2005 (*Aboly-Foundation Award*)
8. Jeffrey Scalan, B.S. Physics (UG Res.: ‘Reliability of new detector for Accelerator Mass Spectrometry’) 2004
9. Matthew Budd, B.S. Physics (UG Res.: ‘Hall measurements on clathrate materials’) 2004
10. Jesse Hester, B.S. Physics (UG Res.: ‘Calibration of the heating ability of thermoelectrics’) 2004
11. Matthew Beekman, B.S. Physics (UG Res.: ‘Thermal properties of elemental  $\text{Si}_{136}$ : A guest-free clathrate material’) 2003 (*Aboly-Foundation Award*)
12. Luke Caraker, B.S. Physics (UG Res.: ‘Skutterudite Materials Research’) 2003
13. Eric Townsend, B.S. Physics (UG Res.: ‘Densification and investigation of  $\text{MgB}_2$ ’) 2001

### **Service on Thesis and Dissertation Committees**

- 1) Mr. Joshua Martin – Mentor, Ph.D. Physics, scheduled for 2007
- 2) Mr. Mathew Beekman – Mentor, Ph.D. Physics, scheduled for 2008
- 3) Mr. Ted Wangensteen – Ph.D. Physics, scheduled for 2009
- 4) Mr. Devajyoti Mukherjee – Ph.D. Physics, scheduled for 2008
- 5) Ms. Mariana Potcoava – Ph.D. Physics, scheduled for 2008
- 6) Mr. Robert Hyde – Ph.D. Physics, scheduled for 2007
- 7) Mr. James Gass – Ph.D. Physics, scheduled for 2008
- 8) Mr. Benji Grayson – Ph.D. Chemical Engineering, scheduled for 2007
- 9) Ms. Lindsay Hussey – M.S. Physics, 2007
- 10) Mr. Chris Mann – Ph.D. Physics, 2006
- 11) Ms. Hoang Nguyen – M.S. Physics, 2006
- 12) Ms. Natalie Frey – M.S. Physics, 2004
- 13) Mr. Robert Hyde – M.S. Physics, 2004 (dual M.S. in Physics & Engineering)
- 14) Mr. Mark Lefevre – M.S. Physics, 2004
- 15) Mr. Houssam A. Mourad – Ph.D. Physics, 2004
- 16) Ms. Jessica Wilson – M.S. Physics, 2004
- 17) Mr. Renko Hajndl – M.S. Physics, 2002
- 18) Mr. Michael Kaeser – M.S. Physics, 2000 (Clemson University, Department of Physics & Astronomy)

### **Interviews in the public media**

1. I was interviewed on the *WUSF* radio station program *University Beats* by Mark Shreiner that aired January 13-19, 2002. The interview focused on my Materials Physics research, achievements and future technological goals. The interview can be heard by login onto the WUSF website or at <http://chuma.cas.usf.edu/~gnolas/Homepage.html>.
2. I was interviewed and quoted for a *New York Times* article for the November 27th, 2001 issue in the technology section. My expertise in the field of thermoelectrics was required for this article. The interview was based on an update of the current state of the technology, the Materials Research Society Symposium I was organizing at the time and technological achievements in the field.
3. I was interviewed and quoted for Technology Research News, December 19, 2001, regarding the current state of thermoelectrics technology and future prospects.

### **Other Research and Creative Activities**

1. My laboratory and research was reported in the Research Overview section of the *University of South Florida Office of Research 2001-2002 Annual Report*. It also included an overview of my research on new and novel materials.
2. An overview of my research appeared in *USF Magazine*, Vol. 44, no. 1, p. 20 (2002).
3. **G.S. Nolas** in *Who's Who in America: Science and Engineering*, 5<sup>th</sup> edition, Marquis Who's Who, New Providence, NJ, 2001.
4. L. Qiu, I.P. Swainson, **G.S. Nolas**, M.A. White and C.I. Ratcliff, 'Thermal and Dynamic Properties of Semiconductor Clathrates by Powder Neutron Diffraction'; Canadian Institute for Neutron Scattering research proposal accepted and work accomplished at the National Research Council of Canada, Chalk River facility, 2001
5. A.P. Wilkinson, C. Lind, R.A. Young, S.D. Shastri, P.L. Lee, Y. Zhang and **G.S. Nolas**, 'New semiconductors may help you stay cool or power your automobile electronics', in *Advanced Photon Source Forefront, Synchrotron Radiation Instrumentation Sector*, annual publication, 2001, pp. 9-11.
6. **G.S. Nolas**, 'Partially filled skutterudites for better thermoelectrics' in *High-tech Materials Alert*, July, 2000, John Wiley, Inc.

## Publications

### Book

- *Thermoelectrics: Basics Principles and New Materials Developments*  
**G.S. Nolas**, J.W. Sharp and H.J. Goldsmid, Springer-Verlag, Heidelberg, 2001.

### Editorials (4)

- Proceedings of the 2005 Materials Research Society **Volume 886**, *Materials and Technologies for Direct Thermal-to-Electrical Energy Conversion*, Editors: J. Yang, T. Hogan, R. Funahashi and **G.S. Nolas**
- Proceedings of the 2003 Materials Research Society **Volume 793**, *Thermoelectric Materials 2003 – Research and Applications*, Editors: **G.S. Nolas**, J. Yang, T. Hogan and D.C. Johnson
- Proceedings of the 2001 Materials Research Society **Volume 691**, *Thermoelectric Materials 2001 – Research and Applications*, Editors: **G.S. Nolas**, D.C. Johnson and D. Mandrus.
- Proceedings of the 2000 Materials Research Society **Volume 626**, *New Materials for Small Scale Thermoelectric Refrigeration and Power Generation Applications*  
Editors: T.M. Tritt, **G.S. Nolas**, M. Kanatzidis, G. Mahan and D. Mandrus.

### Review Articles (8)

- **G.S. Nolas**, J. Poon and M. Kanatzidis, ‘Recent Developments in Bulk Thermoelectric Materials’, *Materials Research Society Bulletin* **31**, 199 (2006).
- **G.S. Nolas**, ‘Structure, transport and thermoelectric properties of clathrate compounds’, in *Thermoelectrics Handbook: Macro to Nano-Structured Materials*, edited by D.M. Rowe, CRC Press, Boca Raton, FL, 2005, p. 33-1.
- **G.S. Nolas** and H.J. Goldsmid, ‘Thermal Conductivity of Semiconductors’, in *Thermal Conductivity-2003: Theory, Properties and Applications*, edited by T.M. Tritt, Kluwar Press, 2004, p. 105.
- **G.S. Nolas**, J. Yang and H.J. Goldsmid, ‘Bulk Thermoelectric Materials’, in *Thermal Conductivity-2003: Theory, Properties and Applications*, edited by T.M. Tritt, Kluwar Press, 2004, p. 123.
- **G.S. Nolas**, ‘Clathrate Thermoelectrics’, in *Chemistry, Physics and Materials Science of Thermoelectric Materials, Beyond Bismuth Telluride*, edited by M.G. Kanatzidis, S.D. Mahanti and T.P. Hogan, Kluwer Academic/Plenum Press, 2003, p. 107
- **G.S. Nolas**, ‘Skutterudites: Promising materials for thermoelectric application’, in *Recent Research Developments in Physics*, Vol. 2, ed: S.G. Pandalai, Transworld Research, 2001, p 239.
- **G.S. Nolas**, G.A. Slack and S.B. Schujman, ‘Semiconductor Clathrates: A Phonon-Glass Electron-Crystal Material with Potential for Thermoelectric Applications’, in *Semiconductors and Semimetals*, Vol. 69, ed. T.M. Tritt, Academic Press, 2001, p 255.
- **G.S. Nolas**, D.T.- Morelli and T.M. Tritt, ‘Skutterudites: A phonon-glass-electron-crystal approach to advanced thermoelectric energy conversion applications’, *Annu. Rev. Mat. Res.* **29**, 89 (1999).

### **Journal Articles (61, refereed)**

- 1 C.L. Condrón, S.M. Kauzlarich and G. S. Nolas, ‘Structure and Thermoelectric Characterization of  $A_x\text{Ba}_{8-x}\text{Al}_{14}\text{Si}_{31}$  ( $A = \text{Sr}, \text{Eu}$ ) Single Crystals’, *Inorganic Chem*
- 2 M. Beekman, W. Wong-Ng, J.A. Kaduk, A. Shipario, and **G.S. Nolas**, ‘Synthesis and single-crystal X-ray diffraction studies of new framework substituted type II clathrates,  $\text{Cs}_8\text{Na}_{16}\text{Ag}_x\text{Ge}_{136-x}$  ( $x < 7$ )’, *J. Solid State Chem*, in press.
- 3 M. Beekman, J.A. Kaduk, Q. Huang, W. Wong-Ng, Z. Yang, D. Wang, and **G.S. Nolas**, ‘Synthesis and crystal structure of  $\text{Na}_{1-x}\text{Ge}_{3+z}$ : A novel zeolite-like framework phase in the Na-Ge system’, *Chem Comm* **8**, 837 (2007).
- 4 **G.S. Nolas**, M. Beekman, R.W. Ertenberg and J. Yang, ‘Low temperature transport properties of Ni-doped  $\text{CoGe}_{1.5}\text{Se}_{1.5}$ ’, *J. Appl. Phys.* **100**, 036101 (2006).
- 5 **G.S. Nolas**, G. Fowler and J. Yang, ‘Assessing the role of filler atoms on the thermal conductivity of filled skutterudites’, *J. Appl. Phys.* **100**, 043705 (2006).
- 6 C.L. Condrón, J. Martin, **G.S. Nolas**, P.M.B. Piccoli, A.J. Schultz, and S.M. Kauzlarich, ‘Structure and Thermoelectric Characterization of  $\text{Ba}_8\text{Al}_{14}\text{Si}_{31}$ ’, *Inorg. Chem.* **45**, 9381 (2006).
- 7 M. Beekman and **G.S. Nolas**, ‘Synthesis and thermal conductivity of type II silicon clathrates’, *Physica B* **383**, 111 (2006).
- 8 R.P. Hermann, V. Keppens, P. Bonville, **G.S. Nolas**, F. Grandjean, G.J. Long, H.M. Christen, B.C. Chakoumakos, B.C. Sales, and D. Mandrus, ‘Direct Experimental Evidence for Atomic Tunneling of Europium in Crystalline  $\text{Eu}_8\text{Ga}_{16}\text{Ge}_{30}$ ’, *Phys. Rev. Lett.* **97**, 017401 (2006).
- 9 S. Srinath, J. Gass, D.J. Rebar, G.T. Woods, H. Srikanth and **G.S. Nolas**, ‘Giant magnetic effect in clathrates’, *J. Appl. Phys.* **99**, 08K902 (2006).
- 10 G. T. Woods, J. Martin, M. Beekman, R.P. Hermann, Fernande Grandjean, V. Keppens, O. Leupold, G.J. Long, and **G.S. Nolas**, ‘Magnetic and electronic properties of  $\text{Eu}_4\text{Sr}_4\text{Ga}_{16}\text{Ge}_{30}$ ’, *Phys. Rev. B*, **73** 174403 (2006).
- 11 J. Martin, S. Erickson, **G.S. Nolas**, P. Alboni, T.M. Tritt, J. Yang, ‘Structural and transport properties of  $\text{Ba}_8\text{Ga}_{16}\text{Si}_x\text{Ge}_{30-x}$  clathrates’, *J. Appl. Phys.* **99**, 044903 (2006).
- 12 R. P. Hermann, W. Schweika, O. Leupold, R. Ruffer, **G. S. Nolas**, F. Grandjean, and G. J. Long, ‘Neutron and nuclear inelastic scattering study of the Einstein oscillators in Ba, Sr, and Eu filled germanium clathrates’, *Phy. Rev. B* **72**, 174301 (2005).
- 13 **G. S. Nolas**, G. Fowler and J. Yang. ‘Partial Filling of Skutterudites: Optimization for Thermoelectric Applications’, *J. Mater. Res.* **20**, 3234 (2005).
- 14 W. Gou, Y. Li, J. Chi, J.H. Ross, M. Beekman and **G.S. Nolas**, ‘NMR study of slow atomic motion in  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$  clathrate’, *Phys. Rev. B* **71**, 174307 (2005).
- 15 G. A. Lamberton, Jr., R. H. Tedstrom, T. M. Tritt and **G. S. Nolas**, ‘Thermoelectric Properties of Yb-filled Ge-compensated  $\text{CoSb}_3$  Skutterudite Materials’, *J. Appl. Phys.* **97**, 113715 (2005).
- 16 J. Gryko, R.F. Marzke, G.A. Lamberton, T.M. Tritt, M. Beekman and **G.S. Nolas**, ‘Electron structure and temperature dependent shifts in  $^{123}\text{Cs}$  NMR spectra of  $\text{Cs}_8\text{Ge}_{136}$  clathrate’, *Phys. Rev. B* **71**, 115208 (2005).
- 17 **G.S. Nolas**, G. Yoon, H. Sellinschegg, A. Smalley and D.C. Johnson, ‘Synthesis and Transport properties of  $\text{HfFe}_4\text{Sb}_{12}$ ’, *Appl. Phys. Lett.* **86**, 042111 (2005).
- 18 **G.S. Nolas**, J.L. Cohn, J.S. Dyck, C. Uher, G.A. Lamberton and T.M. Tritt, ‘Low-temperature transport properties of polycrystalline  $\text{Ba}_8\text{Ga}_{16}\text{Sn}_{30}$ ’, *J. Mater. Res.* **19**, 3556 (2004).
- 19 F. Chen, J. Schulman, Y. Xue, C.W. Chu, **G.S. Nolas**, ‘Thermal conductivity measurement under hydrostatic pressure using the 3-omega method’, *Rev. Sci. Inst.* **75**, 4578 (2004).
- 20 L. Qiu, I.P. Swainson, **G.S. Nolas**, M.A. White, ‘Structure, thermal and transport properties of the clathrates  $\text{Sr}_8\text{Zn}_8\text{Ge}_{38}$ ,  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$  and  $\text{Ba}_8\text{Ga}_{16}\text{Si}_{30}$ ’, *Phys. Rev. B* **70**, 035208 (2004).
- 21 **G.S. Nolas**, J. Yang and H. Takizawa, ‘Transport properties of germanium-filled  $\text{CoSb}_3$ ’, *J. Appl. Phys.* **84**, 5210 (2004).

- 22 J.A. Kaduk, W. Wong-Ng and **G.S. Nolas**, ‘X-ray diffraction patterns of two clathrates,  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$  and  $\text{Cs}_8\text{Na}_{16}\text{Ge}_{136}$ : Promising Candidates for thermoelectric applications’, *The Rigaku Journal* **20**, 2 (2003).
- 23 **G.S. Nolas** C.A. Kendziora and H. Takizawa, ‘Polarized Raman-scattering study of Ge and Sn-filled  $\text{CoSb}_3$ ’, *J. Appl. Phys.* **94**, 7440 (2003).
- 24 **G.S. Nolas**, J. Yang and R.W. Ertenberg, ‘Transport properties of  $\text{CoGe}_{1.5}\text{Se}_{1.5}$ ’, *Phys. Rev. B* **68**, 193206 (2003).
- 25 Y. Zhang, A. Wilkinson, **G.S. Nolas**, P.L. Lee and J.P. Hodges, ‘Strategies for solving neighboring-element problems: a case study using resonant X-ray diffraction and pulsed neutron diffraction to examine  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$ ’, *J. Appl. Crystallography* **36**, 1182 (2003).
- 26 **G.S. Nolas**, M. Beekman, J. Gryko, G. Lamberton, T.M. Tritt and P.F. McMillan, ‘Thermal conductivity of the elemental silicon clathrate  $\text{Si}_{136}$ ’, *Appl. Phys. Lett.*, **82**, 910 (2003).
- 27 **G.S. Nolas**, C.A. Kendziora, J. Gryko, J. Dong, A. Poddar, C.W. Myles and O.F. Sakey, ‘Raman scattering study of stoichiometric Si and Ge type II clathrates’, *J. Appl. Phys.* **92**, 7225 (2002).
- 28 **G.S. Nolas** and H. J. Goldsmid, ‘The Figure of Merit in Amorphous Thermoelectrics’, *Phys. Stat. Sol. (a)* **194**, 271 (2002).
- 29 C.W. Myles, J. Dong, O.F. Sankey, C.A. Kendziora and **G.S. Nolas**, ‘Vibrational properties of tin clathrate materials’, *Phys. Rev. B* **65**, 235208 (2002).
- 30 Y. Zhang, P.L. Lee, **G.S. Nolas**, and A.P. Wilkinson, ‘Gallium distribution in the clathrate  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$  and  $\text{Sr}_4\text{Eu}_4\text{Ga}_{16}\text{Ge}_{30}$  by resonant diffraction’, *Appl. Phys. Lett.* **80**, 2931 (2002).
- 31 **G.S. Nolas**, D.G. Vanderveer, A.P. Wilkinson and J.L. Cohn, ‘Temperature Dependent structural and transport properties of the type II clathrates  $\text{A}_8\text{Na}_{16}\text{E}_{136}$  (A = Cs or Rb and E = Ge or Si)’, *J. Appl. Phys.* **91**, 8970 (2002).
- 32 A.P. Wilkinson, C. Lind, R.A. Young, S.D. Shastri, P.L. Lee and **G.S. Nolas**, ‘Preparation, transport properties and structure analysis by resonant x-ray scattering of the type-I clathrate  $\text{Cs}_8\text{Cd}_4\text{Sn}_{42}$ ’, *Chem. Mater.* **14**, 1300 (2002).
- 33 **G.S. Nolas**, J.L. Cohn, J. Dyck, C. Uher and J. Yang, ‘Transport properties of Sn-clathrates’, *Phys. Rev. B* **65**, 165201 (2002).
- 34 F. Chen, K.L. Stokes, **G.S. Nolas**, ‘Thermoelectric properties of tin clathrates under hydrostatic pressure’, *J. Phys. Chem. Solids* **63**, 827 (2002).
- 35 G.A. Lamberton, Jr., S. Bhattacharya, R.T. Littleton IV, T.M. Tritt and **G.S. Nolas**, ‘High figure of merit in Eu-filled  $\text{CoSb}_3$  skutterudites’, *Appl. Phys. Lett.* **80**, 598 (2002).
- 36 **G.S. Nolas**, J.-M. Ward, J. Gryko, L. Qiu, and M.A. White, ‘Transport properties of  $\text{Na}_8\text{Si}_{46}$ ’, *Phys. Rev. B* **64**, 153201 (2001).
- 37 **G.S. Nolas** and G.A. Slack, ‘Thermoelectric Clathrates’, *American Scientist* **89**, 136 (2001).
- 38 R. Patschke, X. Zhang, D. Singh, J. Schindler, C.R. Kannewurf, N. Lowhorn, T.M. Tritt, **G.S. Nolas** and M.G. Kanatzidis, ‘Thermoelectric properties and electronic structure of the cage compounds  $\text{A}_2\text{BaCu}_8\text{Te}_{10}$  (A=K, Rb, Cs) systems with low thermal conductivity’, *Chem. Mater.* **13**, 613 (2001).
- 39 J.F. Meng, N.V. Chandra Shekar, J.V. Badding and **G.S. Nolas**, ‘Threefold enhancement of the thermoelectric figure of merit for pressure tuned  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$ ’, *J. Appl. Phys.* **89**, 1730 (2001).
- 40 **G.S. Nolas** and C.A. Kendziora, ‘Raman scattering study of Ge and Sn compounds with the type-I clathrate hydrate crystal structure’, *Phys. Rev. B* **62**, 7157 (2000).
- 41 **G.S. Nolas**, B.C. Chakoumakos, B. Mahieu, G.J. Long and T.J.R. Weakley, ‘Structural characteristics and thermal conductivity of type-I tin clathrates’, *Chem. Mater.* **12**, 1947 (2000).
- 42 **G.S. Nolas**, M. Kaeser, R. Littleton, IV and T.M. Tritt, ‘High figure of merit partially Ytterbium filled skutterudite materials’, *Appl. Phys. Lett.* **77**, 1855 (2000).
- 43 **G.S. Nolas**, H. Takizawa, T. Endo, H. Sellinschegg and D.C. Johnson, ‘Thermoelectric properties of Sn-filled skutterudites’. *J. Appl. Phys.* **77**, 52 (2000).

- 44 S.B. Schujman, **G.S. Nolas**, R.A. Young, C. Lindt, G.A. Slack, R. Patschke, M.G. Kanatzidis, M. Ulutagay and S.-J. Hwu, 'Structural analysis of the thermoelectric clathrate compound  $\text{Sr}_3\text{Ga}_{16}\text{Ge}_{30}$ ', *J. Appl. Phys.* **87**, 1529 (2000).
- 45 **G.S. Nolas**, T.J.R. Weakley, J.L. Cohn and R. Sharma, 'Structural properties and thermal conductivity of crystalline Ge-clathrates', *Phys. Rev. B* **61**, 3845 (2000).
- 46 B.C. Chakoumakos, B.C. Sales, D.C. Mandrus and **G.S. Nolas**, 'Structural disorder and thermal conductivity of the semiconducting clathrate  $\text{Sr}_3\text{Ga}_{16}\text{Ge}_{30}$ ', *J. Alloy Comp.* **296**, 80 (2000).
- 47 B.B. Iversen, A.E.C. Palmqvist, D. Cox, **G.S. Nolas** and G.D. Stucky, N. Blake and H. Metiu, 'Why are clathrates good thermoelectric materials?', *J. Solid State Chem* **149**, 455 (2000).
- 48 **G.S. Nolas**, T.J.R. Weakley and J.L. Cohn, 'Structural, chemical and transport properties of a new clathrate compound:  $\text{Cs}_8\text{Zn}_4\text{Sn}_{42}$ ', *Chem. Mater.* **11**, 2470 (1999).
- 49 **G.S. Nolas** and H.J. Goldsmid, 'A comparison of projected thermoelectric and thermionic refrigeration', *J. Appl. Phys.* **85**, 4066 (1999).
- 50 **G.S. Nolas** and C.A. Kendziora, 'A Raman spectroscopy investigation of lanthanide-filled and unfilled skutterudites', *Phys. Rev. B.* **59**, 6189 (1999).
- 51 J.L. Cohn, **G.S. Nolas**, V. Fessatidis, T.H. Metcalf and G.A. Slack, 'Glass-like heat conduction in high-mobility crystalline semiconductors', *Phys. Rev. Lett.* **82**, 779 (1999).
- 52 **G.S. Nolas**, J.L. Cohn, G.A. Slack and S.B. Schujman, 'Semiconductor Ge-clathrates: promising candidates for thermoelectric applications', *Appl. Phys. Lett.* **73**, 176 (1998).
- 53 **G.S. Nolas**, J.L. Cohn and G.A. Slack, 'The effect of partial void filling on the lattice thermal conductivity of skutterudites', *Phys. Rev. B.* **58**, 164 (1998).
- 54 **G.S. Nolas**, V.G. Harris, T.M. Tritt and G.A. Slack, 'Low-temperature transport properties of the mixed-valence semiconductor  $\text{Ru}_{0.5}\text{Pd}_{0.5}\text{Sb}_3$ ', *J. Appl. Phys.* **80**, 6304 (1996).
- 55 T.M. Tritt, **G.S. Nolas**, G.A. Slack, D.T. Morelli, A.C. Ehrlich, D.J. Gillespie and J.L. Cohn, 'Low temperature transport properties of the filled and unfilled  $\text{IrSb}_3$  skutterudite system', *J. Appl. Phys.* **79**, 8412 (1996).
- 56 **G.S. Nolas**, G.A. Slack, D.T. Morelli, T.M. Tritt and A.C. Ehrlich, 'The effect of rare-earth-filling on the lattice thermal conductivity of Skutterudites', *J. Appl. Phys.* **79**, 4002 (1996).
- 57 **G.S. Nolas**, G.A. Slack, T. Caillat and G.P. Meisner, 'Raman scattering study of antimony-based skutterudites', *J. Appl. Phys.* **79**, 2622 (1996).
- 58 **G.S. Nolas**, V.G. Tsoukala, S.K. Gayen and G.A. Slack, 'Intra-4*f* electronic Raman scattering in cerium-doped scandium oxide and barium gadolinium tantalate', *J. Lum.* **63**, 124 (1995).
- 59 **G.S. Nolas**, V.G. Tsoukala, S.K. Gayen and G.A. Slack, 'Site-selective electronic Raman excitation spectroscopy of the lowest 4*f*5*d* transitions of  $\text{Ce}^{3+}:\text{Y}_2\text{O}_3$ ', *Opt. Lett.* **19**, 1574 (1994).
- 60 **G.S. Nolas**, V.G. Tsoukala, S.K. Gayen and G.A. Slack, 'Electronic Raman scattering study of the low-lying energy levels of trivalent cerium-doped yttria', *Phys. Rev. B.* **50**, 150 (1994).
- 61 G.A. Slack, S.L. Dole, V.G. Tsoukala and **G.S. Nolas**, 'The optical absorption spectrum of trivalent cerium in  $\text{Y}_2\text{O}_3$ ,  $\text{Ba}_2\text{GdTaO}_6$ ,  $\text{ThO}_2$  and related compounds', *J. Opt. Soc. Am. B.* **11**, 961 (1994).

**Conference Proceedings (54, refereed)**

- 1 D.Wang and **G.S. Nolas**, “Thermoelectric Properties of mix-crystals of  $Mg_2E$  ( $E=Si, Ge$ )- $Mg_3Sb_2$ ”, to appear in the Proceedings of Ceramic Engineering and Science, 2007.
- 2 J. Martin, D. Wang and **G.S. Nolas**, “Synthesis and characterization of nanocrystalline chalcogenides” to appear in the Proceedings of Ceramic Engineering and Science, 2007.
- 3 M. Beekman, R.H Hyde, D. Mukherjee, S. Witanachchi, P. Mukherjee, and **G. S. Nolas**, “Preparation and Physical Properties of Group IV Clathrates”, to appear in the Proceedings of Ceramic Engineering and Science, 2007.
- 4 R.H. Hyde, M. Beekman, D. Mukherjee, G.S. Nolas, P. Mukherjee and S. Witanachchi, “Growth and characterization of germanium-based type I clathrate thin films deposited by pulsed laser ablation”, to appear in the Proceedings of Ceramic Engineering and Science, 2007.
- 5 S. Witanachchi, R. Hyde, V. Vithianathan, M. Beekman, P. Mukherjee and **G.S. Nolas**, “Synthesis and characterization of bulk and thin film type I and type II clathrate materials for thermoelectric and optoelectronic application”, Proc. of the Twenty Fifth International Conference on Thermoelectrics (IEEE catalog # 06TH8931, Piscataway, NJ, 2006), p. 44.
- 6 R.P. Hermann, F. Grandjean, V. Keppens, W. Schweitka, **G.S. Nolas**, D.G. Mandrus, B.C. Sales, H.M. Christen, P. Bonville and G.J. Long, ‘The dynamics of the guests in filled germanium clathrates’, Mat. Res. Soc. Symp. Proc. **886**, 389 (2006).
- 7 M. Beekman, J. Gryko and **G.S. Nolas**, ‘Transport properties of type II sodium-silicon clathrates’, Mat. Res. Soc. Symp. Proc. **886**, 395 (2006).
- 8 S. Witanachchi, R. Hyde, H.S. Nagaraja, M. Beekman, **G.S. Nolas** and P. Mukherjee, ‘Growth and characterization of germanium-based type I clathrate thin films deposited by pulsed laser ablation’, Mat. Res. Soc. Symp. Proc. **886**, 401 (2006).
- 9 J. Martin, S. Erickson, **G.S. Nolas**, P. Alboni and T.M. Tritt, “Thermoelectric Properties of Ba-Filled Si-Ge Alloy Type I Semiconducting Clathrates”, Proceedings of the Twenty Fourth International Conference (IEEE catalog # 05TH8854, Piscataway, NJ, 2005), p. 219.
- 10 M. Beekman, J. Gryko, H.F. Rubin, J.A. Kaduk, W. Wong-Ng, and **G.S. Nolas**, “Synthesis and Transport Properties of Type II Clathrates”, Proceedings of the Twenty Fourth International Conference (IEEE catalog # 05TH8854, Piscataway, NJ, 2005), p. 223.
- 11 G. Fowler and **G.S. Nolas**, “Assessing the role of the filler atoms on the thermal conductivity of filled-skutterudites”, Proceedings of the Twenty Fourth International Conference (IEEE catalog # 05TH8854C, Piscataway, NJ, 2005), p. 448.
- 12 **G.S. Nolas**, M. Beekman, J. Martin, H.F. Rubin, S. Erickson, G.A. Lamberton, and T.M. Tritt, ‘Research on “Open Structured” materials for thermoelectric power generation’, Proceedings of the Twenty Third International Thermoelectrics Conference Conference (IEEE, Piscataway, NJ, 2005), p. 10.
- 13 C.A. Kendziora and **G.S. Nolas**, ‘Phonons and Thermal Conductivity in Skutterudite Thermoelectrics’, Mat. Res. Soc. Symp. Proc. **793**, 107 (2004).
- 14 R. Ertenberg, M. Beekman, J. Martin, G. Fowler, J. Yang and **G.S. Nolas**, ‘ $CoGe_{1.5}Se_{1.5}$ : Synthesis and Characterization’, Mat. Res. Soc. Symp. Proc. **793**, 239 (2004).
- 15 **G.S. Nolas**, ‘Clathrate Thermoelectrics’, Proceedings of the 27<sup>th</sup> Thermal Conductivity / 15<sup>th</sup> Thermal Expansion Conference (DEStech Publications, Lancaster, PA, 2004) p. 32.
- 16 M.A. White, L. Qiu and **G.S. Nolas**, ‘Simple Method for Estimation of Heat Capacity of Solids: Implications for Thermoelectrics’, Proceedings of the 27<sup>th</sup> Thermal Conductivity / 15<sup>th</sup> Thermal Expansion Conference (DEStech Publications, Lancaster, PA, 2004) p. 72.
- 17 Matt Beekman, **G.S. Nolas**, Jan Gryko, Gary A. Lamberton, Jr., Terry M. Tritt, and Chris A. Kendziora, ‘Transport and optical properties of the type II clathrates  $Cs_8Na_{16}Si_{136}$  and  $Si_{136}$ ’, Low Temperature Electronics and Low Temperature Co-fired Ceramic Based Electronic Devices (ECS, Pennington, NJ, 2004) p. 271.

- 18 **G.S. Nolas** and H.J. Goldsmid, 'Amorphous Thermoelectrics', Proceedings of the Twenty First International Conference on Thermoelectrics, (IEEE Catalog # 02TH8657, Piscataway, NJ, 2002), p. 296.
- 19 F. Chen, K.L. Stokes and **G.S. Nolas**, 'Pressure effect of Seebeck coefficient for zinc doped tin Clathrates', Mat. Res. Soc. Symp. Proc. **691**, 93 (2002).
- 20 R.H. Tedstrom, G.A. Lamberton, T.M. Tritt and **G.S. Nolas**, 'High temperature electrical transport properties of Eu and Yb-doped skutterudites', Mat. Res. Soc. Symp. Proc. **691**, 221 (2002).
- 21 G.A. Lamberton, R.H. Tedstrom, T.M. Tritt and **G.S. Nolas**, 'Thermoelectric Properties of Eu-doped CoSb<sub>3</sub>', Mat. Res. Soc. Symp. Proc. **691**, 31 (2002).
- 22 R.F. Marzke, **G.S. Nolas** and J. Gryko, '<sup>133</sup>Cs and <sup>23</sup>Na NMR studies of Cs<sub>8</sub>Na<sub>16</sub>Ge<sub>136</sub> clathrates', Mat. Res. Soc. Symp. Proc. **691**, 439 (2002).
- 23 GH. Anno, K. Ashida, K. Matsubara, **G.S. Nolas**, K. Akai, M. Matsuura and J. Nagao, 'Electronic structure and thermoelectric properties of ytterbium-filled skutterudites', Mat. Res. Soc. Symp. Proc. **691**, 49 (2002).
- 24 H. Takizawa, K. Okazaki, K. Uheda, T. Endo and **G.S. Nolas**, 'High Pressure Synthesis of New Filled Skutterudites', Mat. Res. Soc. Symp. Proc. **691**, 37 (2002).
- 25 **G.S. Nolas**, "'Open structure" materials with unique properties and potential for thermoelectric applications', Proc. Fourth Pacific Rim Int. Conf. on Advanced Materials and Processing (PRICM4, The Japan Institute of Metals, 2001), p. 2113.
- 26 **G.S. Nolas**, C. Lind, A. Wilkinson and J.L. Cohn, 'Temperature dependent single crystal structural and thermoelectric properties of Cs<sub>8</sub>Na<sub>16</sub>Si<sub>136</sub> and Cs<sub>8</sub>Na<sub>16</sub>Ge<sub>136</sub>', Proceedings of the Twentieth International Conference on Thermoelectrics (IEEE catalog # 01TH8589, Piscataway, NJ, 2002), p. 254.
- 27 H.J. Goldsmid and **G.S. Nolas**, 'A review of new thermoelectric materials', Proceedings of the Twentieth International Conference on Thermoelectrics (IEEE catalog # 01TH8589, Piscataway, NJ, 2002), p. 1.
- 28 H. Anno, **G.S. Nolas**, K. Akai, K. Ashida, M. Matsuura and K. Matsubara, 'Electronic structure of Yb-filled CoSb<sub>3</sub> skutterudites studied by x-ray photoelectron spectroscopy', Proceedings of the Twentieth International Conference on Thermoelectrics (IEEE catalog # 01TH8589, Piscataway, NJ, 2002), p. 61.
- 29 T.M. Tritt, R.T. Littleton, A.L. Pope, S. Bhattacharya, M. Kaeser, J.W. Kolis, S.J. Poon, V. Ponnambalam, Y. Xia, **G.S. Nolas**, J.S. Olson and R. Gagnon, 'Strategies for the investigation of new bulk materials for thermoelectric applications', Proceedings of the Nineteenth International Conference on Thermoelectrics (IEEE catalog # 01TH8589, Piscataway, NJ, 2002), p. 5.
- 30 **G.S. Nolas**, "'Open Structure" semiconductors: Clathrate and channel compounds for low thermal conductivity thermoelectric materials', Mat. Res. Soc. Symp. Proc. **658**, GG11.1 (2001).
- 31 **G.S. Nolas**, J.L. Cohn, M. Kaeser and T.M. Tritt, 'Thermal conductivity of type I and II clathrate compounds', Mat. Res. Soc. Symp. Proc. **626**, Z13.1 (2001).
- 32 **G.S. Nolas**, M. Kaeser, T.M. Tritt, H. Sellinschegg, D.C. Johnson and E. Nelson, 'Partially-filled skutterudites: Optimizing the thermoelectric properties', Mat. Res. Soc. Symp. Proc. **626**, Z10.1 (2001).
- 33 H. Sellinschegg, J.R. Williams, G. Yoon, D.C. Johnson, M. Kaeser, T.M. Tritt, **G.S. Nolas** and E. Nelson, 'The synthesis of metastable skutterudites and crystalline superlattices', Mat. Res. Soc. Symp. Proc. **626**, Z1.1.1 (2001).
- 34 H. Sellinschegg, D.C. Johnson, M. Kaeser, T.M. Tritt, **G.S. Nolas** and E. Nelson, 'Bulk synthesis of completely and partially filled Sn filled CoSb<sub>3</sub> using the multilayer repeat method', Mat. Res. Soc. Symp. Proc. **626**, Z10.2 (2001).

- 35 J.R. Williams, D.C. Johnson, M. Kaeser, T.M. Tritt, **G.S. Nolas** and E. Nelson, 'Synthesis and physical properties of skutterudite superlattices', *Mat. Res. Soc. Symp. Proc.* **626**, Z2.3 (2001).
- 36 N.A. Ghelani, S.Y. Loo, D. Chung, S. Sportouch, S. de Nardi, M.G. Kanatzidis, T.P. Hogan and **G.S. Nolas**, 'Characterization of new materials in a four-sample thermoelectric measurement system', *Mat. Res. Soc. Symp. Proc.* **626**, Z8.6 (2001).
- 37 **G.S. Nolas**, J.L. Cohn, B.C. Chakoumakos and G.A. Slack, 'Glass-like thermal conductivity in crystalline semiconductors', *Proceedings of the 25th International Thermal Conductivity/13th International Thermal Expansion Conference*, C. Uher and D.T. Morelli, eds. (Technomic, Lancaster, PA, 2000), p. 122.
- 38 A.E.C. Palmqvist, B.B. Iversen, L. Furenlid, **G.S. Nolas**, D. Bryan, S.Latturner and G.D. Stucky, 'Charge transfer and local structure in thermoelectric germanium clathrates', *Mat. Res. Soc. Symp. Proc.* **590**, 145 (2000).
- 39 B.B. Iversen, A.E.C. Palmqvist, D. Bryan, S. Latturner, G.D. Stucky, N. Blake, H. Metiu, **G.S. Nolas** and D. Cox, 'Maximum entropy method charge density distributions of novel thermoelectric clathrates', *Mater. Res. Soc. Symp. Proc.* **590**, 51 (2000).
- 40 **G.S. Nolas**, J.L. Cohn and E. Nelson, 'Transport properties of tin clathrates', *Proceedings of the Eighteenth International Conference on Thermoelectrics (IEEE catalog # 99TH8407, Piscataway, NJ, 1999)*, p. 493.
- 41 J.R. Williams, H. Sellinschegg, J. Casperson, J. Harris, C. Daniels-Hafer, D.C. Johnson, **G.S. Nolas** and E. Nelson, 'Synthesis of skutterudite superlattices by controlled crystallization of elementally modulated reactants', *Proceedings of the Eighteenth International Conference on Thermoelectrics (IEEE catalog # 99TH8407, Piscataway, NJ, 1999)*, p. 5.
- 42 H. Sellinschegg, D.C. Johnson, **G.S. Nolas** and T.M. Tritt, 'The effect of various filler atoms on the thermoelectric properties of ternary skutterudites', *Proceedings of the Eighteenth International Conference on Thermoelectrics (IEEE catalog # 99TH8407, Piscataway, NJ, 1999)*, p. 19.
- 43 H. Sellinschegg, A. Smalley, G. Yoon, D.C. Johnson, **G.S. Nolas**, M. Kaeser and T.M. Tritt, 'Synthesis of filled skutterudite compounds with varied degree of filling', *Proceedings of the Eighteenth International Conference on Thermoelectrics (IEEE catalog # 99TH8407, Piscataway, NJ, 1999)*, p. 352.
- 44 **G.S. Nolas**, 'Semiconducting clathrates: a PGEC system with potential for thermoelectric applications', *Mater. Res. Soc. Symp. Proc.* **545**, 435 (1999).
- 45 H. Sellinschegg, J.R. Williams, D.C. Johnson and **G.S. Nolas**, 'The synthesis of metastable skutterudites using superlattice reactants', *Mater. Res. Soc. Symp. Proc.* **545**, 37 (1999).
- 46 S.B. Schujman, G.A. Slack, H.C. Nguyen, **G.S. Nolas**, R.A. Young, F. Mohammed and T.M. Tritt, 'Analysis of antimony-tin-based skutterudites', *Mater. Res. Soc. Symp. Proc.* **545**, 47 (1999).
- 47 K.L. Stokes, A.C. Ehrlich and **G.S. Nolas**, 'Thermal conductivity of Fe-doped  $\text{CoSb}_3$  skutterudites', *Mater. Res. Soc. Symp. Proc.* **545**, 339 (1999).
- 48 **G.S. Nolas**, G.A. Slack, J.L. Cohn and S.B. Schujman, 'The next generation of thermoelectric materials', *Proceedings of the Seventeenth International Conference on Thermoelectrics*, edited by K. Kuomoto (IEEE catalog # 98TH8365, Piscataway, NJ, 1998) p. 294.
- 49 H. Sellinschegg, D.C. Johnson, **G.S. Nolas**, G.A. Slack, S.B. Schujman, F. Mohammed, T.M. Tritt and E. Nelson, 'A novel approach to thermoelectrics materials research of skutterudites', *Proceedings of the Seventeenth International Conference on Thermoelectrics*, edited by K. Kuomoto (IEEE catalog # 98TH8365, Piscataway, NJ, 1998) p. 338.
- 50 **G.S. Nolas**, H.B. Lyon, J.L. Cohn, T.M. Tritt and G.A. Slack, 'Expanding the investigation of the thermoelectric properties of rare-earth-filled skutterudites', *Proceedings of the Sixteenth International Conference on Thermoelectrics*, edited by A. Heinrich and J. Schumann (IEEE catalog # 97TH8291, Piscataway, NJ, 1997) p. 321.

- 51 J.W. Sharp, **G.S. Nolas** and E.H Volckmann, 'Studies of bulk materials for thermoelectric cooling', Mat. Res. Soc. Symp. Proc. 478, 91 (1997).
- 52 **G.S. Nolas** and H.B. Lyon, 'Thermoelectrics in industry: needs, desires and potential', Proceedings of the Third European Workshop on Thermoelectrics, edited by D.M. Rowe (Babrow Press, Cardiff, UK, 1996) p. 65.
- 53 **G.S. Nolas** and G.A. Slack, 'New thermoelectric materials based on IrSb<sub>3</sub>', Proceedings of the Fourteenth International Conference on Thermoelectrics, edited by M.V. Vedernikov, M.I. Fedorov and A.E. Kaliazin (Ioffe Physical-Technical Institute, St. Petersburg, Russia, 1995) p. 236.
- 54 T.M. Tritt, D.J. Gillespie, A.C. Ehrlich, **G.S. Nolas**, G.A. Slack and J.L. Cohn, 'Low temperature transport properties of IrSb<sub>3</sub>', Proceedings of the Fourteenth International Conference on Thermoelectrics, edited by M.V. Vedernikov, M.I. Fedorov and A.E. Kaliazin (Ioffe Physical-Technical Institute, St. Petersburg, Russia, 1995) p. 240.

***Plenary and Invited Conference Presentations, Seminars and Colloquia (47)***

- 1 G.S. Nolas, 'Novel Materials for Energy Technology', Invited, University of Kentucky Physics Seminar, Lexington, KY, March 21, 2007.
- 2 G.S. Nolas, 'Overview and new directions in bulk materials research for thermoelectric power generation applications', Invited, Presented at the 31st International Cocoa Beach Conference & Exposition on Advanced Ceramics and Composites, Daytona, FL, January 21, 2007.
- 3 G.S. Nolas, 'Structure-property relationships in novel materials', Invited, University of Alabama Birmingham Physics Colloquium, Birmingham, Alabama, March 17, 2006.
- 4 G.S. Nolas, 'Structure-property relationships in novel materials: Clathrates', Invited, Auburn University Physics Colloquium, Auburn, Alabama, February 17, 2006.
- 5 G.S. Nolas, 'Structure and transport properties of silicon clathrates', Invited, Third Hiroshima Workshop on Novel Functional Materials with Multinary Freedom, Hiroshima, Japan, November 17, 2005.
- 6 G.S. Nolas, 'Structure-Property relationships in novel materials: Clathrates', Invited, Ubiquen Seminar, National Institute of Advanced Industrial Science and Technology (AIST), Osaka, Japan, November 14, 2005.
- 7 G.S. Nolas, 'Structural, transport, magnetic and thermal properties of type I and II clathrates', Invited, American Physical Society March Meeting, Los Angeles, CA, March 21, 2005
- 8 G.S. Nolas, 'Clathrates: Novel materials with technological potential', Invited, Department of Materials Science, University of Tennessee, Knoxville, TN, March 15, 2005.
- 9 G.S. Nolas, 'Research on inorganic materials with the clathrate-hydrate crystal structure', Invited, Department of Chemistry, University of Florida, Gainesville, FL, November 10, 2004.
- 10 G.S. Nolas, 'Type II germanium clathrates for thermoelectric applications', Invited, Direct Energy Conversion Workshop, Coronado, CA, December 11-13, 2004.
- 11 G.S. Nolas, 'Silicon clathrates and alloys for high temperature thermoelectric applications', Invited, STMC Materials Workshop, Presented at the NASA Jet Propulsion Laboratory, Pasadena, CA, November 8, 2004.
- 12 G.S. Nolas, 'Overview and new directions in bulk materials research for thermoelectric power generation', Invited Plenary Presentation at the International Thermoelectrics Conference, July 26, 2004, Adelaide, Australia.
- 13 G.S. Nolas, 'Applied physics in industry', Invited, University of South Florida Society of Physics Students, April 7, 2004.
- 14 G.S. Nolas, 'Thermal Conductivity of Clathrates', Invited, International Thermal Conductivity / Thermal Expansion Conference, Knoxville, TN, October 27, 2003.
- 15 G.S. Nolas, 'Transport properties of clathrate Zintl phases', Invited, American Chemical Society, New York, NY, September 8, 2003.
- 16 G.S. Nolas, 'Transport properties of Group-IV Clathrates', Joint Physics and Materials Science Seminar, Texas A&M University, College Station, TX, February 28, 2003.
- 17 G.S. Nolas, 'Thermoelectric Clathrates', Invited, Thermoelectrics Workshop: Chemistry, Physics and Materials Science of Thermoelectrics Beyond Bismuth Telluride, Traverse City, MI, August 17, 2002.
- 18 G.S. Nolas, 'Zeolite-like Semiconductors: Science and Technology', Joint Chemistry & Physics Seminar, Jacksonville State University, AL, November 1, 2002.
- 19 G.S. Nolas, 'Clathrate semiconductors: Scientifically interesting materials with technological importance', Seminar, General Motors R&D and Planning, Warren, MI, August 15, 2002.
- 20 G.S. Nolas, 'Localized Disorder in Crystalline Materials: Structure-Property Relationships in Zeolite-like Semiconductors', Seminar, Michigan State University Department of Electrical and Computer Engineering, East Lansing, MI, March 14, 2002.

- 21 G.S. Nolas, 'Open structured Semiconductors: Scientifically Interesting Materials with Technological Importance', Seminar, University of Mississippi Department of Physics and Astronomy, Oxford, MS, April 30, 2002.
- 22 G.S. Nolas, 'Semiconducting Clathrates: Promising Candidates for Thermoelectric Applications', Physics Colloquium, University of South Florida, Tampa, FL, February 12, 2001.
- 23 G.S. Nolas, 'Thermoelectric "open structure" materials', Seminar, Department of Electrical and Materials Engineering, Science University of Tokyo at Yamaguchi, Ube, Japan, January 18, 2001.
- 24 G.S. Nolas, "'Open structure" semiconductors: clathrate and channel compounds for low thermal conductivity thermoelectric materials', Invited, Materials Research Society, Solid State Chemistry Symposium, Boston, MA, November 30, 2000.
- 25 G.S. Nolas, 'Low Thermal Conductivity Solids', Guest Lecturer for a graduate course in Semiconductor Physics, Department of Physics, Texas Tech University, Lubbock, TX, November 9, 2000.
- 26 G.S. Nolas, 'Structure-property relationships: A Thermoelectric Problem?', Physics Seminar, Texas Tech University, Lubbock, TX, November 2, 2000.
- 27 G.S. Nolas, 'Thermal Properties of Novel Framework Materials', Chemistry Seminar, Georgia Institute of Technology, Atlanta, GA, October 16, 2000.
- 28 G.S. Nolas, 'Semiconductors with an "open structure": Materials with potential for thermoelectric applications', Plenary, presented at the American Ceramics Society, Electronics Materials Division meeting, Clemson, SC, October 10, 2000.
- 29 G.S. Nolas, 'Low thermal conductivity semiconductors (high and low temperature materials) for thermoelectric applications', Seminar, Department of Chemistry, Nagoya University, Nagoya, Japan, June 29, 2000.
- 30 G.S. Nolas, 'Skutterudites: Low thermal conductivity semiconductors for thermoelectric applications', Seminar, Department of Materials Chemistry, Tohoku University, Sendai, Japan, June 26, 2000.
- 31 G.S. Nolas, 'Low thermal conductivity semiconductors with potential for thermoelectric applications', Thermoelectrics Seminar, Shonan Institute of Technology Alumni Center, Tokyo, Japan, June 20, 2000.
- 32 G.S. Nolas, 'Elements of thermoelectrics', Invited, American Institute of Chemical Engineers, North Texas Regional Meeting, Dallas, TX, March 2, 2000.
- 33 G.S. Nolas, 'Rattling atoms in open structured semiconductors: potential for thermoelectric applications', Physics Colloquium, University of North Texas, Denton, TX, October 6, 1999.
- 34 G.S. Nolas, 'Thermoelectric materials: theory, applications and the future', Physics Colloquium, University of New Orleans, New Orleans, LA, April 9, 1999.
- 35 G.S. Nolas, 'The phonon-glass electron-crystal approach to thermoelectric materials research', combined Physics and Materials Science Department Seminar, University of North Texas, Denton, TX, February 23, 1999.
- 36 G.S. Nolas, 'Glass-like thermal transport properties in semiconductors: applications for thermoelectrics', Condensed Matter and Optics Seminar, Department of Physics, Rensselaer Polytechnic Institute, Troy, NY, December 7, 1998.
- 37 G.S. Nolas, 'Semiconducting clathrates: a PGEC system with potential for thermoelectric applications', Invited, Materials Research Society meeting in Boston, November 30-December 3, 1998.
- 38 G.S. Nolas, 'Thermoelectrics for cooling and power generation', Physics Seminar, Department of Physics, Clemson University, Clemson, SC, August 11, 1998.
- 39 G.S. Nolas, 'Novel materials research for thermoelectrics applications', presented at the Corporate Manufacturing Research Center, Motorola, Schaumburg, IL, June 12, 1998.

- 40 G.S. Nolas, 'The next generation of thermoelectric materials', Invited, Seventeenth International Conference on Thermoelectrics, Nagoya, Japan, May 26, 1998.
- 41 G.S. Nolas, 'Clathrates: The next generation of thermoelectric materials', Invited, Mini-Symposium on Clathrate Research, Center for Solid State Science, Arizona State University, Tempe, AZ, February 11, 1998.
- 42 G.S. Nolas, 'Thermoelectric research through innovation', Organic/Inorganic Chemistry Seminar, University of Oregon, Eugene, OR, November 14, 1997.
- 43 G.S. Nolas, 'Skutterudites: potential for thermoelectric cooling applications', Seminar, U.S. Naval Research Laboratory, Washington, DC, June 19, 1997.
- 44 G.S. Nolas and H.B. Lyon, 'Thermoelectrics in industry: needs, desires and potential', Invited, Third European Workshop on Thermoelectrics, Cardiff, UK, September 16 and 17, 1996.
- 45 G.S. Nolas, 'The effect of rare-earth-filling on skutterudites', Seminar, Marlow Industries, Inc., Dallas, TX, November 20, 1995.
- 46 G.S. Nolas, 'New thermoelectric materials based on IrSb<sub>3</sub>', Optics and Condensed Matter Seminar, Department of Physics, Rensselaer Polytechnic Institute, Troy, NY, April 17, 1995.
- 47 G.S. Nolas and V. G. Tsoukala, 'Electronic Raman scattering of rare earth-doped metal oxides', Seminar, General Electric Research and Development Center, Schenectady, NY, August 25, 1992.

**Conference Abstracts & Presentations (45, not included in any category above, first author is presenter)**

- 1 J. Martin B. Zhang, L. Chen and **G.S. Nolas**, “Synthesis and Characterization of Nanocomposite Chalcogenides”, presented at the American Physical Society, Denver, CO, March 7, 2007.
- 2 W. Wong-Ng, M. Beekman, **G.S. Nolas**, J.A. Kaduk, Q. Huang and Zhi Yang, “Crystal Chemistry and Crystallography of Novel Phase  $\text{Na}_{1-x}\text{Ge}_{3+z}$ ”, Presented at the Materials Research Society Conference, Boston, MA, Nov 27 – Dec 1, 2006.
- 3 S. Srinath, J. Gass, D. Rebar, G. Woods, H. Srikanth and **G.S. Nolas**, ‘Giant MCE in clathrates’, Presented at the Fiftieth Magnetism and Magnetic Materials Conference, San Jose, CA, Oct 31 – Nov. 3, 2005.
- 4 W. Gou, Y. Li, J.I. Chi, J.H. Ross, M. Beekman and **G.S. Nolas**, ‘NMR study of atomic hopping in type-I Sr-Ga-Ge clathrate’, Presented at the American Physical Society March meeting, Los Angeles, CA, March 21-25, 2005.
- 5 R.P. Hermann, V. Keppens, F. Grnadjean, O. Leupold, R. Ruffer, **G.S. Nolas** and G.J. Long, ‘A nuclear inelastic and nuclear forward scattering study of  $\text{Eu}_8\text{Ga}_{16}\text{Ge}_{30}$ ’, Presented at the American Physical Society March meeting, Los Angeles, CA, March 21-25, 2005.
- 6 H.F. Rubin, M. Beekman, J. Martin, S.J. Erickson and G.S. Nolas, ‘Synthesis and characterization of type II clathrates’, Presented at the Southeast Section of the American Physical Society Meeting, Knoxville, TN, November 11 – 13, 2005.
- 7 J. Martin, M. Beekman, S.J. Erickson, H.F. Rubin and G.S. Nolas, ‘Optimization of  $\text{Ba}_8\text{Ga}_{16}\text{Si}_8\text{Ge}_{22}$  type I semiconducting clathrates’, Presented at the Southeast Section of the American Physical Society Meeting, Knoxville, TN, November 11 – 13, 2005.
- 8 F. Chen, J. Shulman, Y. Xue, C.W. Chu, M. Beekman, **G.S. Nolas**, ‘Thermoelectric Properties of  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$  under high pressure’, Presented at the American Physical Society March meeting, Montreal, Canada, March 22-26, 2004.
- 9 H. Mourad, M. Beekman, **G.S. Nolas**, S. Witanachchi and P. Mukherjee, ‘Growth of type I clathrate  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$  thin films’, Presented at the American Physical Society March meeting, Montreal, Canada, March 22-26, 2004.
- 10 **G.S. Nolas**, J.A. Kaduk and W. Wong-Ng, ‘X-ray diffraction studies of two germanium clathrates  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$  and  $\text{Cs}_8\text{Na}_{16}\text{Ge}_{136}$ : Promising Materials for Thermoelectric Applications’, Presented at the American Ceramics Society annual meeting, Indianapolis, Indiana, April 18 – 23, 2004.
- 11 H. Abou Mourad, M. Beekman, **G.S. Nolas** and S. Witanachchi, ‘Growth of type-I clathrates  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$  thin film’, Presented at the American Physical Society march meeting in Montreal, Canada, March 22 – 26, 2004.
- 12 R.P. Hermann, F. Grandjean, P. Bonville, H. Grimm, W. Schweika, **G.S. Nolas** and G.J. Long, ‘A neutron scattering and Eu-151 Mossbauer spectral study of the guest dynamics in filled germanium clathrates’, Presented at the American Physical Society march meeting in Montreal, Canada, March 22 – 26, 2004.
- 13 F. Chen, J. Schulman, Y. Xue, C.W. Chu, M. Beekman and **G.S. Nolas**, ‘Thermoelectric properties of  $\text{Sr}_8\text{Ga}_{16}\text{Ge}_{30}$  under high pressure’, Presented at the American Physical Society march meeting in Montreal, Canada, March 22 – 26, 2004.
- 14 G.A. Lamberton, T.M. Tritt, R.W. Ertenberg, M. Beekman, **G.S. Nolas**, ‘Overview of the thermoelectrics properties of Yb-filled  $\text{CoSb}_3$  skutterudites’, National Institute of Advanced Industrial Science and Technology, Osaka, Japan, July, 25, 2003.
- 15 G. Lamberton, T.M. Tritt, R.W. Ertenberg, M. Beekman and **G.S. Nolas**, ‘Overview of the thermoelectric properties of Yb-filled skutterudites’ Presented at the American Physical Society March meeting, Austin, TX, March 3-7, 2003.

- 16 C. Kendziora, **G.S. Nolas**, D. Mandrus and B.C. Sales, 'Raman scattering studies of filled and unfilled skutterudite and clathrates for thermoelectric applications' Presented at the American Physical Society March meeting, Austin, TX, March 3-7, 2003.
- 17 F. Chen, K.L. Stokes, **G.S. Nolas** and C.W. Chu, 'Pressure effects of Seebeck coefficient for tin clathrates' Presented at the American Physical Society March meeting, Austin, TX, March 3-7, 2003.
- 18 J. Gryko, **G.S. Nolas**, and R.F. Marzke, 'NMR, DSC and electrical conductivity studies of germanium clathrate compounds' Presented at the American Physical Society March meeting, Austin, TX, March 3-7, 2003.
- 19 J. Gryko, **G.S. Nolas**, M. Beekman, G. Lamberton, T.M. Tritt and P.F. McMillan, 'Thermal properties of silicon clathrate  $\text{Si}_{136}$ ' Presented at the American Physical Society March meeting, Austin, TX, March 3-7, 2003.
- 20 M. Beekman, R.W. Ertenberg, L. Caraker and **G.S. Nolas**, 'Synthesis and characterization of  $\text{CoGe}_{1.5}\text{Se}_{1.5}$ , a novel skutterudite compound', Presented at the 126<sup>th</sup> National Meeting of the American Association of Physics Teachers, Society of Physics Students Invited Symposium, January 13-17, Austin, TX, 2003.
- 21 **G.S. Nolas**, R.W. Ertenberg, M. Beekman, L.S. Caraker, M. Kerr, G.A. Lamberton and T.M. Tritt 'Clathrate for Thermoelectric Applications', Presented at the Twentieth International Conference on Thermoelectrics, Long Beach, CA, August 26-29, 2002.
- 22 A.P. Wilkinson, Y. Zhang, P.L. Lee, **G.S. Nolas**, 'Solving neighboring elemental problems in type-I clathrates using resonant diffraction', presented at the Materials Research Society, Boston, MA, December 2-6, 2002.
- 23 R. W. Ertenberg, M. Beekman, L. Caraker, J. Yang and G. S. Nolas, 'CoGe<sub>1.5</sub>Se<sub>1.5</sub>: A New Skutterudite Material', Presented at the Southeast Regional APS meeting in Auburn, AL, October 31-November 2, 2002.
- 24 Jan Gryko, **G.S. Nolas** and R. Marzke, 'Large knight shift in partially filled type II germanium clathrates', presented at the American Physical Society March meeting, Indianapolis, IN, March 18, 2002.
- 25 C. Kendziora and **G.S. Nolas**, 'Raman scattering studies of filled and unfilled Si, Ge and Sn type I and II clathrates for thermoelectric applications', presented at the American Physical Society March meeting, Seattle, WA, March 15, 2001.
- 26 F. Chen, K.L. Stokes, **G.S. Nolas**, J. Dong and O.F. Sankey, 'Transport properties of clathrate  $\text{Cs}_8\text{A}_n\text{Sn}_{46-n}$  under high pressure', presented at the American Physical Society March meeting, Seattle, WA, March 15, 2001.
- 27 F. Chen, K.L. Stokes and **G.S. Nolas**, 'Transport properties of  $\text{Cs}_8\text{Sn}_{44}$  clathrate under pressure', presented at the American Ceramics Society, Electronics Materials Division meeting, Clemson, SC, October 10, 2000.
- 28 L.Qiu, M.A. White, J.S. Tse and **G.S. Nolas**, 'Thermal properties of novel framework materials: Semiconductor clathrates', presented at the Sixteenth IUPAC Conference on Chemical Thermodynamics, August 6-11, 2000, Halifax, Nova Scotia, Canada.
- 29 A.P. Wilkinson, D. Vanderveer, C. Lind, R.A. Young, S. Shastri, P. Lee and **G.S. Nolas**, 'Very short wavelength powder diffraction studies of clathrate thermoelectrics', presented at the Fiftieth Annual American Crystallographic Association, July 22-27, 2000, St. Paul, MN.
- 30 J.R. Williams, D.C. Johnson and **G.S. Nolas**, 'Synthesis of new metastable skutterudite compounds using modulated elemental reactants', American Chemical Society, March 26-30, 2000, San Francisco, CA.
- 31 H. Sellinschegg, D.C. Johnson and **G.S. Nolas**, 'Bulk synthesis of skutterudite compounds with various filler atoms using the multilayer repeat method', American Chemical Society, March 26-30, 2000, San Francisco, CA.

- 32 A.P. Wilkinson, D.G. VanDerveer, C. Lind, R.A. Young, S.D. Shastri, P.L. Lee, **G.S. Nolas**, 'Disorder in clathrate thermoelectrics', American Chemical Society, March 26-30, 2000, San Francisco, CA.
- 33 B.C. Chakoumakos, B.C. Sales, D.G. Mandrus, J.W. Sharp, **G.S. Nolas**, 'Thermoelectric clathrates', International Union of Crystallographic XVIII Congress, August 4-13, 1999, Glasgow, Scotland.
- 34 B.C. Chakoumakos, B.C. Sales, D.G. Mandrus, J.W. Sharp, **G.S. Nolas**, N.R. Dilley and M.B. Maple, 'Thermal conductivity from atomic displacement parameters', American Crystallographic Association Annual Meeting, May 22-27, 1999, Buffalo, NY.
- 35 M. Kaeser, T.M. Tritt, **G.S. Nolas**, R.T. Littleton, P. Alboni and A.L. Pope, 'Thermoelectric properties of partially filled skutterudites', presented at the Southeast Regional American Physical Society meeting, November 7-9, 1999, Chapel Hill, NC.
- 36 **G.S. Nolas**, J.L. Cohn, M. Kaeser, T.M. Tritt, S.B. Schujman and G.A. Slack, 'Glass-like heat conduction in crystalline clathrate semiconductors', presented at the March meeting of the American Physical Society, March 20-26, 1999, Atlanta, GA.
- 37 **G.S. Nolas** and C.A. Kendziora, 'A Raman spectroscopy investigation of lanthanide filled and unfilled skutterudites', presented at the March meeting of the American Physical Society, March 20-26, 1999, Atlanta, GA.
- 38 A. Kaeser, T.M. Tritt and **G.S. Nolas**, 'Properties of doped Si and Ge clathrates', presented at the March meeting of the American Physical Society, March 20-26, 1999, Atlanta, GA.
- 39 M. Fakhrudin, M.L. Wilson, T.M. Tritt and **G.S. Nolas**, 'Thermoelectric properties of filled and unfilled skutterudites', presented at the Southeast Regional American Physical Society meeting, November 9-11, 1997, Nashville, TN.
- 40 **G.S. Nolas**, 'New materials research for thermoelectric applications', presented at the Texas Regional American Physical Society meeting, October 9-11, 1997, Denton, TX.
- 41 T.M. Tritt, **G.S. Nolas**, G.A. Slack, A.C. Ehrlich, D.J. Gillespie and J.L. Cohn, 'Low temperature transport properties of the filled and unfilled IrSb<sub>3</sub> skutterudite system', presented at the March meeting of the American Physical Society, March 19-23, 1996, St. Louis, MO.
- 42 T.M. Tritt, A.C. Ehrlich, D.J. Gillespie, **G.S. Nolas** and G.A. Slack, 'Thermal and electrical transport properties of porous IrSb<sub>3</sub>', presented at the March meeting of the American Physical Society, March 20-24, 1995, San Diego, CA.
- 43 **G.S. Nolas**, V.G. Tsoukala, S.K. Gayen and G.A. Slack, 'Site selective electronic Raman excitation study of the 4f/5d transitions in trivalent cerium-activated yttria', presented at the Conference on Lasers and Electro-Optics/International Quantum Electronics Conference (CLEO/IQEC '94), May 8-13, 1994, Anaheim, CA.
- 44 **G.S. Nolas**, V.G. Tsoukala, S.K. Gayen and G.A. Slack, 'Electronic Raman scattering in Ce<sup>3+</sup>:Sc<sub>2</sub>O<sub>3</sub>', presented at the March meeting of the American Physical Society, March 21-25, 1994, Pittsburgh, PA.
- 45 **G.S. Nolas**, V.G. Tsoukala, S.K. Gayen and G.A. Slack, 'Resonance enhancement and site selectivity of electronic Raman transitions in trivalent cerium-doped yttria', presented at the International Conference on Luminescence (ICL'93), August 14-18, 1993, Storrs, CN.