JOHN KOUVETAKIS

2016 Activity Highlights for Teaching, Research and Service

Undergraduate Teaching in 2016

- **Chem 471/571** solid state chemistry, Spring Semester 2016
- **Chem 114** (chemistry for engineers) Fall semester 2016 including a number of honors contracts for chem. 114 students.

Graduate Students and Post Docs

- **C. L. Senaratne** Ph.D. graduated in 8/2016 with a Ph.D. in Chemistry and he moving to work with Intel Corp in Oregon.
- **Patrick Sims** Ph.D, candidate in Chemistry,
- **Patrick Wallace** Ph.D. candidate in Chemistry,
- **Robert Allen** (summer 2016),
- **Vincenzo Sells** (undergraduate from aerospace engineering)
- **Dr. Chi Xu** post doc

Service

- Budget and Personnel Committee (SMS)
- Graduate Programs Committee (SMS)
- Committee on Valley Connections (SMS)
- I continue to review papers for Chemistry of Materials, Applied Physics Letters, Semiconductor Science and Technology etc.

Publications/conference talks 2016:

- **8** papers appeared in 2016 (one of these is still published only on line since September).
- **4** papers have been submitted or published in 2017 (see CV).
- **7** conference talks in 2016 are listed in the CV.

Proposals:
Four proposals were submitted in 2016 (see below):

- **Funded** (Air Force Labs, Wright Patterson Air Force Base). STTR Phase 1 (9 months) "Low-Defect GeSn and SiGeSn for Integrated High-Performance SWIR and MWIR Optoelectronics" $75,000 ASU portion (PI). The industrial partner is Freedom Photonics.
- R**ecommended for funding on** January 2017 AFOSR. "Electrically Injected SiGeSn Lasers" $375,000 (PI)
- **Pending:** Two other proposals to NSF are pending.
  (1) I am a part of a major NSF proposal "Materials and Engineering Research Center" (MRSEC) from ASU submitted in December 2016. My contribution on synthesis of

main group borides was a major part of the project . The budget is $15,600,000 and my recognition will be 15% if funded.

(2) NSF GOALI: Semiconductors with new functionalities via smart chemical precursor method $753,345 (PI). The industrial collaborator is Northrup Grumman

A CV follows with details of the above activities with past courses taught and past research grants removed for brevity.

JOHN KOUVETAKIS

CONTACT INFORMATION:

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Arizona State University
Tempe, AZ 85287-1604F
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EDUCATION:

1984	B. S., Chemistry with Honors, Senior project advisor: Prof. Neil Bartlett University of California, Berkeley, CA
1984 - 1988	Ph.D., Solid-State Inorganic Chemistry Research Advisors: (late) Leo Brewer and (late) Neil Bartlett University of California, Berkeley, CA
1988 - 1989	Postdoctoral Staff Member Supervisor: (late) Bruce Scott. IBM T. J. Watson Research Center**,** Yorktown Heights NY

PROFESSIONAL EXPERIENCE:

2002 - present	Professor of Chemistry, Arizona State University
1998 - 2002	Associate Professor of Chemistry**,** Arizona State University
1992 - 1998	Assistant Professor of Chemistry**,** Arizona State University
1989 - 1992	Staff Scientist**,** Raychem Corporation, (part of TYCO International) Corporate Technology Division, Menlo Park, CA

PROFESSIONAL ACTIVITIES:

2010	ASU Faculty achievement award in defining edge research creative activities.
2006	Innovator of the year Award ASU/Arizona Technology Enterprises
2006	Elected Affiliate Professor of Physics and Astronomy (ASU) (2006-2009)
1999	Visiting Scientist, IBM T. J. Watson Research Center, Yorktown Heights NY
1994	Young Investigator Award, National Science Foundation

1992 Visiting Scientist, Lawrence Berkeley National Labs, Berkeley CA

EDITORIAL APPOINTMENTS:

2009-2010 Associated Editor, Journal of the Electrochemical Society
2000-2002 Editorial Board of Inorganic Chemistry
2005-2010 Editorial Board of Chemistry of Materials

RESEARCH INTERESTS:

- Synthesis of main-group inorganic hydrides for applications in materials science.
- Silicon-based photonic materials: growth and devices (photodetectors, modulators, emitters and photovoltaics).
- Epitaxial integration of dissimilar materials with Si (including III-V and II-VI compounds for monolithic integration).
- Optoelectronic wide band gap semiconductors.
- Advanced semiconductor materials for breakthrough photovoltaic applications.
- Solid-state inorganic chemistry based on light elements (refractory carbides, nitrides, borides and C-N frameworks).

ISSUED US PATENTS (ASU):

[1] **US Patent 5,606,056: "Carbon nitride and its synthesis",** J. Kouvetakis and M. Todd**,** (issued 1997).

[2] **US Patent 6,207,844: "Novel compositions of matter and methods of depositing pure thin films of gallium nitride semiconductors**", J. Kouvetakis and J. Mc Murran (issued 1999).

[3] **US Patent 6,897,471: "Strained engineered direct-gap Ge/Sn_xGe_{1-x} heterodiode and multi-quantum well photodetectors, lasers, emitters, and modulators grown on $Sn_ySi_xGe_{1-y-z}$ buffered silicon"**, R.A. Soref, J. Menendez and J. Kouvetakis (issued 2005)**.**

[4] **US Patent 6,911,084: "Low temperature epitaxial growth of quaternary wide bandgap semiconductors"**, J. Kouvetakis, I.S.T. Tsong, Radek Roucka and J. Tolle (issued 2005)**.**

[5] **US Patent 7,238,596:** "**Method for preparing $Ge_{1-x-y}Sn_xE_y$ (E=P, As, Sb) semiconductors and related Si-Ge-Sn-E and Si-Ge-E analogs"**, J. Kouvetakis, M.R. Bauer, J. Tolle and C. Cook (issued 2007).

[6] **US Patent 7,374,738: "Superhard dielectric compounds and methods of preparation", J. Kouvetakis**, J. Tolle, I.S.T. Tsong, and L. Torrison (issued May 20, 2008).

[7] **US Patent 7,582,891: "Materials and optical devices based on group IV quantum wells grown on Si-Ge-Sn buffered silicon"**, J. Kouvetakis, J. Tolle, and J. Menendez (ASU) and Ling Liao (Intel Corp.), Dean Samara-Rubio (Intel Corp) (issued September 1, 2009).

[8] **US Patent 7,589,003: "GeSn alloys and ordered phases with direct tunable bandgaps grown on silicon"** J. Kouvetakis, M. R. Bauer, J. Tolle, J. Menendez (issued September 15, 2009).

[9] **US patent No 7,598,513** "**$Si_xSn_yGe_{1-x-y}$ and related heterostructures based on Si, Ge and Sn",** J. Kouvetakis, M. R. Bauer and J. Tolle (issued October 6, 2009).

[10] **US Patent 7,781,356: "Epitaxial growth of Group III nitrides on silicon substrates via reflective lattice-matched metal boride buffer layers",** J. Kouvetakis, I.S.T. Tsong, J. Tolle and R. Roucka (issued August 24/2010). International patent application (PCT) submitted 3/2004 **WO 2004073045.**

[11] **US Patent 7,910,468**: Part 1 **"Methods and compositions for preparing Ge/Si semiconductors substrates"** J. Kouvetakis and Y-Y. Fang (issued March 23/2011).

[12] **US Patent No. 7,915,104 B1** "**Methods and compositions for preparing tensile strained Ge on $Ge_{1-y}Sn_y$ buffered semiconductor substrates",** J. Kouvetakis and Yan-Yan Fang (issued March 29/2011).

[13] **US Patent 7,981,392 B2 "Hydride compounds with silicon and germanium core atoms and methods of synthesizing the same"** J. Kouvetakis, Cole Ritter, J. Tolle (issued July 19/2011, licensed to Voltaix Corp.).

[14] **US Patent 8,029,905 B2** "**GeSiSn-based compounds, templates and semiconductor structures",** J. Kouvetakis and R. Roucka. International, patent PCT **WO 2006099171** (patent issued 09/04/2011 (licensed to Translucent Inc).

[15] **US Patent 8,043,980 B2** "**Methods of making halo-silylgernanes"** J. Kouvetakis, J. Tice and Y-Y. Fang (Licensed to Voltaix Corp.) PCT patent application filed on 4/2008 WO 2009005862. (patent issued 10/25/2011).

[16] **US Patent 8,133,802 B2 "Novel silicon-germanium hydrides and methods of making and using same"**. **WO 2007/062096:** "Novel silicon-germanium hydrides which give Ge-Si films with low dislocation densities and surface roughness and methods for synthesis and use in deposition methods"**,** J. Kouvetakis and C. Ritter (US patent issued March 13, 2012 and licensed to Voltaix Corp.).

[17] **US Patent 8,216,537 B2** "**Silicon-germanium hydrides and methods for making and using same"**, J. Kouvetakis, C. Ritter, C-W Hu, I.S.T. Tsong, and A.V.G. Chizmeshya,

PCT/US06/045091 filed Nov 21, 2006.(US patent issued July 10, 2012 and licensed to Voltaix Corp.).

[18] **US Patent 8,518,360 "Silicon-germanium hydrides"** J. Kouvetakis, C. Ritter, C-W Hu, I.S.T. Tsong, and A.V.G. Chizmeshya, (filed July 6 2012, issued **August 27, 2013** and licensed to Voltaix Corp.)

[19] **US Patent 8,524,582 "Silicon-germanium hydrides and methods for making and using same"**, John Kouvetakis and Cole Ritter, patent issued on **September 3, 2013** (filed February 28, 2012). This patent is licensed to Voltaix Corp.

[20] **US patent 8,545,627: "Zirconium and hafnium boride alloy templates on silicon for nitride integration applications"** J. Kouvetakis and R. Roucka (provisional filed 1/2007 and 10/2007 ASU cases M7-041 and M7-887) **Issued Oct 1, 2013.**

[21] **US Patent 8,568,681 B2 "Hydride with silicon and germanium core atoms and methods of synthesizing same" (continuation application)** J. Kouvetakis, Cole Ritter, J. Tolle (**Issued Oct 29, 2013**, licensed to Voltaix Corp.).

[22] **US patent 8,803,194 "Zirconium and hafnium boride alloy templates on silicon for nitride integration applications"** J. Kouvetakis and R. Roucka, issued **Aug 12, 2014.**

[23] **US patent 8821635 "Method for growing Si-Ge semiconductor materials and devices on substrates"** J. Kouvetakis**,** I.S.T Tsong, C.Hu and J. Tolle (licensed to Voltaix part of Air Liquide) issued **Sept 2, 2014.**

RESEARCH GROUP MEMBERS 2016

1. C. L. Senaratne Ph.D. in Chemistry: **graduated in August 2016 (currently with Intel Corp).**
2. Patrick Sims Ph.D. in Chemistry
3. Patrick Wallace Ph.D in Chemistry
4. Chi Xu Post Doc
5. Robert Allen (summer 2016) Ph.D. in Chemistry
6. Vincenzo Sells (undergraduate from aerospace engineering)
7. James Gallagher, Ph.D. Physics, **graduated December 2015 (currently with Intel Corp).**

Ph.D./MS STUDENTS GRADUATED :

1. **Michael Todd, Ph.D.** Chemistry, graduated summer semester 1996. "Synthesis and characterization of metastable materials via UHV-CVD reactions of unimolecular precursors", (Rockwell Corporation).

2. **Lixing Jiang, M.S.** Chemistry, graduated Spring 1996. "Synthesis of boron carbonitrides".

3. **Jeff McMurran, Ph.D.** Chemistry, graduated Fall 1997. (I) "Novel methods to GaN heterostructures via UHV-CVD and inorganic azidogallanes" (II) "Synthesis of related group IV and V covalent systems", (Micron Corp.).

4. **Darrick Williams, Ph.D.** Chemistry, graduated Summer 1998. "Synthesis of new framework systems based on binary and ternary cyanides of B, Al, Ga, In and Tl", (Los Alamos National Laboratory).

5. **Cory Steffek, M.S.** Chemistry, graduated August 1999. "Single-source precursors for the growth of group III nitrides".

6. **Jennifer Taraci, Ph.D.** Chemistry, Fall 2001 "New semiconductor heterostructures and nanostructures in the C-Si-Ge-Sn system**",** (Intel Corp.).

7. **John Tolle, Ph.D.** Science and Engineering of Materials, graduated Fall 2002 **"**Growth of wide band gap optical semiconductors on Si via novel Si-Al-ON and metal boride interfaces", (ASM America Inc.)**.**

8. **Matthew Bauer, Ph.D.** Chemistry, graduated Spring 2003 **"**Si-Ge-Sn semiconductors: new materials with tunable direct band gaps", (Intel Corporation).

9. **Cole Ritter, Ph.D.** Chemistry, graduated Fall 2003 "(I) Synthesis of main group C-N materials in the Li-Be-B-Mg-Al system. (II) Synthesis and applications of group III and IV hydrides" (Voltaix Corp.)

10. **Levi Torrison Ph.D.** Chemistry, graduated Fall 2003**.** "Si-based nanostructures and dielectrics**" (**College of Rio Salado)**.**

11. **Radek Roucka Ph.D**. Science and Engineering of Materials, graduated Summer 2004**.** "Growth of novel wide band gap semiconductors and metal diborides on silicon" (Translucent Inc.).

12. **Rahul Trivedi M.S**. Science and Engineering of Materials, graduated Fall 2005**.** "Integration of cubic optical semiconductors with Si via a zirconium diboride buffer layer", (Intel Corp.).

13. **Candi Cook Ph.D.** Science and Engineering of Materials, graduated Spring 2006. "Optical characterization of group IV heterostructures based on silicon germanium and tin" (Intel Corp.)

14. **Brandon Forrest M.S.** Chemistry, graduated Spring 2008**,** "Integration of indium gallium arsenide, gallium arsenic antimonide, and zinc selenide with silicon via germanium tin silicon composite substrates", (Faculty at Gainesville State College, Gainesville Georgia).

15. **Yu** (**Lily) Yan Ph.D**. Science and engineering of materials, graduated Fall 2008, "Epitaxial growth of semi-metallic hybrid substrate systems for low temperature optoelectronic integration with silicon", (Intel Corp.).

16. **Jesse B. Tice Ph.D**. Chemistry, graduated Fall 2008, "Synthesis and fundamental studies of highly reactive hydride compounds for the fabrication of Si-based materials and devices", (Northrop Grumman Corp.)

17. **Yan-Yan Fang Ph.D**., Science and Engineering of Materials, graduated Spring 2009, "Epitaxy driven synthesis of group IV elemental and alloy materials via designer molecular chemistry", (Faculty, Wuhan National Laboratories for opto-electronics at Huazhong University of Science and Technology, China).

18. **Change' Weng Ph.D**., Chemistry, graduated Spring 2010, "Group IV semiconductors and dielectrics: A combined theoretical and experimental study", (Intel Corp.)

19**. Junqui Xie Ph.D**., Chemistry, graduated Fall 2010, "Growth and activation of group IV semiconductors applications in photodetectors and dielectrics", (Argonne National Laboratory).

20. **Jay Mathews Ph.D**., Physics, graduated Spring 2011. "Investigation of light absorption and emission in Ge and GeSn films grown on Si substrates", (Benét Laboratories at Watervliet Arsenal in Watervliet, NY).

21. **Richard Beeler Ph.D**., Chemistry, graduated Fall 2012. "Epitaxial development of advanced group IV materials and high performance optical devices for applications in Si-photonics and photovoltaics" (Intel Corp.)

22. **Gordon Grzybowski Ph.D**., Chemistry, graduated Spring 2013 "Epitaxy of group IV optical materials and synthesis of IV/III-V semiconductor analogs via designer molecular routes" (AFRL Wright Paterson Air-Force Base).

23. **Chi (Seth) Xu Ph.D**. Physics, graduated Fall 2013, "Synthesis and band gap enginnering in the $Ge_{1-x-y}Si_xSn_y$ materials for near IR wavelength applications".

24. **Liying Jiang Ph.D.** Physics, graduated Spring 2014, "Structural characterization and optical properties of Si,Ge based semiconductor alloys"

25. **Ruben Favaro M.S. Physics** graduated Spring 2014

26. **James Gallagher Ph.D** Physics graduated **December 2015**. "The optical and electronic properties of Ge1-ySny and Ge1-x-ySixSny materials and devices for silicon integrated optolectronics" (Intel Corp.)

27. **Charutha Lasitha Seranatne Ph.D** Chemistry graduated **Summer 2016** "Chemical vapor deposition of metastable germanium based semiconductors for optoelectronic applications" (InteL Corp.)

POSTDOCTORALS SUPERVISED:

1. Phil Bonneau (Ph.D. UCLA), Faculty
2. Phil Matsunaga(Ph.D.UC Berkeley)
3. Louis Brouseau (Ph.D. Penn State)
4. Anthony Calcaterra (Ph.D. ASU)
5. David Nesting (Ph.D.Penn State)
6. Victor Torres (Ph.D. N. Carolina State),
7. Brett Pleune (Ph.D. University of Maryland)
8. Cole Ritter (Ph.D. ASU)
9. Po-Liang Liu (Ph.D. University of Taiwan)
10. Changwu Hu (Ph.D. Physics, Fudan University)
11. Mark Wistey (Ph.D. Electrical Engineering, Stanford)
12. V.R. D'Costa (PhD Physics ASU)

UNDERGRADUATE STUDENTS SUPERVISED:

Jason Hish (Chemistry) 1994
Brad Mc Clay (Chemistry) 1995-1996
Christine Sgomeling (South Dakota School of Mines) summer 1995
Steve Wagner (Chemical Engineering) 1994 -1996
Kasandra Kishner (UC Davis, Chemistry) summer 1997
Blake Simpkins (Chem. engineering) summer 1997
Daniel Heller (Rice U. Chemistry) summer 1997
Benjamin Ashcroft (Glendale Community College) summer 1997
Joseph Madrigal (Chemistry) 1998
Peter Susanto (Chemistry) 1998-1999
Andrew Nowak (Chemistry) 2002-2003.
Siri Stern exchange student from England (Chemistry) 2009
Jeremy McCall (Chemistry) 2010
Hunter (Chemistry) 2011
Edward Skibo (Chemistry) summer 2012
Emanuel Borcean (Physics) Spring and Fall 2013
Doug Bopp (Physics) Fall 2013
Steven Bopp (Materials Science), Summer and Fall 2014-Spring 2015
Karina Grigorets (Chemistry), Spring 2015
Vincenzo Sells (Aerospace engineering 2016)

PUBLICATIONS (BEFORE ASU) 1986-1993:

[1] "A novel graphite-like material of composition BC_3 and nitrogen-carbon graphites," J. Kouvetakis, R. B. Kaner, M. L. Sattler and N. Bartlett, *Journal of Chemical Soc*iety *Chemical Communications* **24,** 1758-1759 (1986).

[2] "Structure of chloro(pentamethylcyclopentadienyl)bis(trimethylphosphine)iridium(III)," R. Kaner, J. Kouvetakis and S. Mayorga, *Acta Crystallographica* **C41,** 500 (1986).

[3] "Boron-carbon-nitrogen materials of graphite-like structure," R. B. Kaner, J. Kouvetakis, J. Warble, C. E. Sattler and N. Bartlett, *Materials Research Bulletin* **22(3),** 399-400 (1987).

[4] "Characterization of newly synthesized novel graphite films," K. M. Krishnan, J. Kouvetakis, T. Sasaki, and N. Bartlett, *Materials Research Society Symp. Proc*. (Better Ceramics through Chemistry, 3) **121***,* 527-30 (1988).

[5] "Thermodynamic properties of generalized Lewis acid-base intermetallics," J. Kouvetakis and L. Brewer, Lawrence Berkeley Laboratory publication, Ph.D. Thesis, Lawrence Berkeley Laboratory Report-25340, (1988).

[6] "Chemical vapor deposition of gallium nitride from diethyl gallium azide," J. Kouvetakis and D. B. Beach, *Chemistry of Materials* 1(4), 476-478 (1989).

[7] "Novel aspects of graphite intercalation by fluorine and fluorides and new B-C, C-N and B-C-N materials based on the graphite network," J. Kouvetakis, T. Sasaki, C. Shen, R. Hagiwara, M. Lerner, K. M. Krishnan and N. Bartlett, *Synthetic Metals* **34,** 1-7 (1989).

[8] "Composition and structure of BN films deposited by CVD from borazine," J. Kouvetakis, V. V. Patel, C. W. Miller and D. B. Beach, *Journal of Vacuum Science Technology* ***8*****(6),** 3929-3933 (1990).

[9] "Synthesis and stability range of MoC with the WC structure," J. Kouvetakis and L. Brewer, *Journal of Phase Equilibria* ***13*****(6),** 601-603 (1992).

[10] "Calculations of thermodynamic properties of metastable phases of the elements," J. Kouvetakis and L. Brewer, *Journal of Phase Equilibria* **14 (5),** 563-571 (1993).

PUBLICATIONS (AT ASU) 1994-present:

[11] "Synthesis of ethynyl-substituted precursors to carbon-nitrogen-sulfur extended structures: reactions of $C_3N_3F_3$ and $C_2N_2SCl_2$ with alkali-metal trimethylsilylacetylides," J. Kouvetakis, D. Grotjahn, P. Becker and S. Moore, *Chemistry of Materials* **6(50),** 636-639 (1994).

[12] "Chemical vapor deposition of a highly conductive boron-doped graphite from triphenyl boron," J. Kouvetakis, M. W. McElfresh and D. B. Beach, *Carbon* **32(6),** 1129-1132 (1994).

[13] "Novel synthetic routes to carbon-nitrogen thin films," J. Kouvetakis, A. Bandari, M. Todd and B. Wilkens, *Chemistry of Materials* ***6*(6),** 811-814 (1994).

[14] "Novel chemical routes to silicon-germanium-carbon materials," J. Kouvetakis, M. Todd, D. Chandrasekhar and D. Smith, *Applied Physics Letters* **65 (23),** 2960-2962 (1994).

[15] "In situ, real time, observation of Al chemical vapor deposition on SiO_2 in an environmental transmission electron microscope," J. Drucker, R. Sharma, J. Kouvetakis and K. Weiss, *Journal of Applied Physics* **77,** 2846-2848 (1995).

[16] "Influence of precursor chemistry on synthesis of silicon-carbon-germanium alloys," M. Todd, J. Kouvetakis, P. Matsunaga, D. Chandrasekhar and D. Smith, *Materials Research Society Symp. Proc*. *(Silicon Technology)* **377,** 529-534 (1995).

[17] "Electron beam assisted chemical vapor deposition of gold," J. Kouvetakis, R. Sharma, B. L. Ramakrishna, J. Drucker and P. Seidler, *Materials Research Society Symp. Proc*., *(Film synthesis and growth using energetic beams)* **388,** 322-328 (1995).

[18] "Growth of heteroepitaxial $Si_{1-x-y}Ge_xC_y$ alloys using novel deposition chemistry," M. Todd, P. Matsunaga, J. Kouvetakis, D. Chandrasekhar and D. J. Smith, *Applied Physics Letters* **67(9),** 1247-1249 (1995).

[19] "Synthetic routes to carbon nitride," M. Todd, J. Kouvetakis, T. Groy, D. Chandrasekhar, D. J. Smith and P. Deal, *Chemistry of Materials* **7,** 1422-1426 (1995).

[20] "Synthesis and characterization of tetrakis(trihalogermyl)methanes. Molecules containing sterically strained carbon centers," P. Matsunaga, J. Kouvetakis and T. Groy, *Inorganic Chemistry* **34,** 5103-5104 (1995).

[21] "Chemical synthesis of metastable germanium carbon alloys grown heteroepitaxially on (100) Si," M. Todd, J. McMurran, J. Kouvetakis and D. J. Smith, *Chemistry of Materials* **8**, 2491-2498 (1996).

[22] "Low temperature inorganic chemical vapor deposition of heteroepitaxial GaN," J. McMurran, M. Todd, J. Kouvetakis and D. J. Smith, *Applied Physics Letters* **69,** 203-205 (1996).

[23] "In situ real time observations of chemical vapor deposition using an environmental TEM," J. Drucker, R. Sharma, K. Weiss, B. L. Ramakrishna and J. Kouvetakis, *Materials Research Society* **404,** 75-84 (1996).

[24] "Growth of GaN on (100) Si using a new C-H and N-H free single-source precursor," J. Kouvetakis, J. McMurran, D. B. Beach and D. J. Smith, *Materials Research Society Symp. Proc*., *(Gallium nitride and related materials)* **395**, 79-84 (1996).

[25] "Synthesis and characterization of heteroepitaxial diamond structured $Ge_{1-x}C_x$ (x=1.5-5%) using chemical vapor deposition," M. Todd, J. Kouvetakis and D. J. Smith, *Applied Physics Letters* **68,** 2407-2409 (1996).

[26] "HREM characterization of heteroepitaxial structures," D. Smith, A. Amali, D. Chandrasekhar, J. Kouvetakis and M. Todd, *Proc. First Int. Symp. Adv. Phys. Fields (Application to Material Science on the Nanometer Scales)* 62-69 (1996).

[27] "New pathways to heteroepitaxial GaN by inorganic CVD. Synthesis and characterization of related Ga-C-N novel systems," J. Kouvetakis, M. O'Keeffe, L. Brousseau, J. McMurran, D. Williams and D. J. Smith, *Materials Research Society Symp. Proc*. **449,** 313-318 (1997).

[28] "Synthesis and structure of a novel Lewis acid-base adduct $(H_3C)_3SiN_3 \cdot GaCl_3$ en route to Cl_2GaN_3 and its derivatives: Inorganic precursors to heteroepitaxial GaN," J. Kouvetakis, J. McMurran, M. O'Keeffe and J. L. Hubbard, *Inorganic Chemistry* **36***,* 1792-1797 (1997).

[29] "Synthesis and characterization of GaC_3N_3 and $MGaC_4N_4$ (M=Li,Cu) framework structures," L. Brousseau, D. Williams, J. Kouvetakis and M. O'Keeffe, *Journal of the American Chemical Society* **119,** 6292-6296 (1997).

[30] "New silicon-carbon materials incorporating Si_4C building blocks," D. Chandrasekhar, J. Kouvetakis, J. McMurran, M. Todd and D. J. Smith, *Materials Research Society Symp. Proc*., (Thin film structure and morphology) **441,** 723-728 (1997).

[31] "Molecular structure of $C(GeBr_3)_4$ by gas-phase electron diffraction and density functional theory calculations: Implications for length and stability of Ge-C bonds in crystalline semiconductor solids," A. Haaland, D. Shorokhov, T. G. Strand, M. O' Keeffe and J. Kouvetakis, *Inorganic Chemistry* **36,** 5198-5201 (1997).

[32] "The disordered crystal structure of $Zn(CN)_2$ and $Ga(CN)_3$," D. J. Williams, D. E. Partin, J. Kouvetakis and M. O'Keeffe, *Journal of Solid State Chemistry* **134,** 164-169 (1997).

[33] "Synthesis of molecular precursors to carbon-nitrogen-phosphorus polymeric systems," J. Kouvetakis, J. McMurran, D. Nesting and J. L. Hubbard, *Chemistry of Materials* **10**, 590-593 (1998).

[34] "Growth and characterization of thin $Si_{80}C_{20}$ films based upon Si_4C building blocks", J. Kouvetakis, D. Chandrasekhar and D. J. Smith, *Applied Physics Letters* **72(8),** 930-932 (1988).

[35] "The use of novel molecular precursors for the high pressure synthesis of metastable materials", D.C. Nesting, J. Kouvetakis, and J. V. Badding, *(National Institute for Research in Inorganic Materials: Advanced Materials*), 1-4 (1998).

[36] "Synthesis and analysis of SiGeC", J. Kouvetakis and J. W. Mayer (5th International Conference on Solid State and Integrated Circuit Technology (Proceedings of IEEE) 1-5 (1998).

[37] "Strategies for the synthesis of highly concentrated $Si_{1-x}C_x$ diamond structured systems", D. Chandrasekhar, J. McMurran, J. Kouvetakis, and D. J. Smith, *Applied Physics Letters* **72(17),** 2117-2119 (1998).

[38] "Ordered structures in unstrained, epitaxial Si-Ge-C materials" J. Kouvetakis, D. Nesting, M.O' Keeffe and D. J. Smith, *Chemistry of Materials* **10(5),** 1396-1401 (1998).

[39] "Novel methods for CVD of heteroepitaxial Ge_4C and $(Ge_4C)_xSi_y$ tetrahedral heterostructures. Synthetic pathways and molecular structures of trigermyl-$HC(GeH_3)_3$ and tetragermyl -$C(GeH_3)_4$ methanes", J. Kouvetakis, Arne Haaland, Dmitry J. Shokorov, Hans Vidar Volder, Georgi V. Sirichev, and Phillip T. Matsunaga, *Journal of the American Chemical Society* **120**, 6738-6744 (1998).

[40] "Formation of a tetrameric, cyclooctane-like, azidochlorogallane $[HClGaN_3]_4$, and related azidogallanes. Exothermic precursors to GaN nanostructures", J. Kouvetakis, J. McMurran, J. L. Hubbard, D. C. Nesting and D. J. Smith, *Journal of the American Chemical Society* **120,** 5233-5237 (1998).

[41] "Synthesis and atomic and electronic structure of new Si-Ge-C alloys and compounds", J. Kouvetakis, D. C. Nestng, and D.J. Smith, (invited review in "Frontiers in Solid State Inorganic Chemistry", *Chemistry of Materials* **10,** 2935-2949 (1998).

[42] "Synthesis of cubic nanoporous $In(CN)_3$ and $Ga_{1-x}In_x(CN)_3$ and corresponding inclusion compounds", D. J. Williams, J. Kouvetakis and M. O'Keeffe, *Inorganic Chemistry* **37,** 4617-4620 (1998).

[43] "The application of chemical methods for the preparation of group IV heterostructures and superlattices", D. Nesting, J. Kouvetakis, Julie Lorentzen, and Jose Menendez, *Materials Research Society Symp. Proc*. (Epitaxy and Applications of Si-Based Heterostructures) **533,** 281-287 (1998).

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[224] "Enhanced performance designs of group-IV light emitting diodes for mid IR photonic applications" J. D. Gallagher, C. L. Senaratne, C. Xu[a], P. M. Wallace, J. Menéndez, and J. Kouvetakis *Electrochemical Society Transactions*, **69 (14)** 147-156 (2015).

[225] "Doping of direct gap $Ge_{1-Y}Sn_y$ alloys to attain electroluminescence and enhanced photoluminescence" C. Senaratne, J. Gallagher, Chi Xu, P. Sims, J. Menendez, J. Kouvetakis, *Electrochemical Society Transactions*, **69 (14)** 157-164 (2015)

[226] "Crystalline tetrahedral phases $Al_{1-x}B_xPSi_3$ and $Al_{1-x}B_xAsT_3$ (T = Si, Ge) via reactions of $Al(BH_4)_3$ and $M(TH_3)_3$ (M = P, As) Patrick Sims, Toshihiro Aoki, Jose Menendez, John Kouvetakis, *ECS Transactions*, **69 (14)** 83-93 (2015).

[227] "CMOS compatible in-situ n-type doping of Ge using new generation doping agents $P(MH_3)_3$ and $As(MH_3)_3$ (M=Si, Ge)" Chi Xu , J. D. Gallagher, C. L. Senaratne, P. E. Sims, J. Kouvetakis and J. Menéndez, *ECS Transactions*, **69(14)** 3-15 (2015).

[228] "Ge-rich $Ge_{1-x}Si_x$ alloys: compositional dependence of the lowest direct and indirect gaps" Chi Xu, J.D. Gallagher, C.L. Senaratne, J. Menéndez, and J. Kouvetakis *Physical Review B* **93**, 125206 (1-9)2016.

[229] "Experimental doping dependence of the lattice parameter in *n*-type Ge: identifying the correct theoretical framework by comparison with Si" Chi Xu, C.L. Senaratne, J. Kouvetakis, and J. Menéndez, *Physical Review B Rapid Communications* **93**, 041201 (R)1-5 (2016).

[230] "Observation of temperature-dependent heavy- and light-hole split direct bandgap and tensile strain from Ge0.985Sn0.015 using photoreflectance spectroscopy" Hyun-Jun Jo, Geun Hyeong Kim, Jong Su Kim, Mee-Yi Ryu, Yung Kee Yeo, and J. Kouvetakis *Current Applied Physics* **16,** 83–87 (2016).

[231] **"**Direct gap $Ge_{1-y}Sn_y$ alloys: Fabrication and design of mid-IR photodiodes", C.L. Senaratne, P.M. Wallace, J. D. Gallagher, J. D., P. E. Sims, J. Kouvetakis and J. Menendez, *Journal of Applied Physics* **120**, 025701 (2016).

[232] "Ultra-low Resistivity Ge:Sb hetero-structures on Si using hydride epitaxy of deuterated stibine and trigermane" Chi Xu, C.L. Senaratne, P. Sims, J. Kouvetakis, and J. Menéndez, *ACS Applied Materials & Interfaces* **8(36),** 23810-23819 (2016).

[233] "Direct bandgap cross-over point of $Ge_{1-y}Sn_y$ grown on Si estimated through temperature-dependent photoluminescence studies", T. R Harris , Mee-Yi Ryu , Yung Kee Yeo , Buguo Wang , C.L. Senaratne , and J. Kouvetakis, *Journal of Applied Physics* **120**, 085706 1-8 (2016).

[234] "Toward GeSn lasers: light amplification and stimulated emission in GeSn waveguides at room temperature" J. Mathews, Z. Li, Y. Zhao, J. D. Gallagher, I. Agha, J. Menéndez, and J. Kouvetakis, *Electrochemical Transactions* **75 (8)** 163-176 (2016)2016.

[235] "Temperature dependence of the interband critical points of bulk Ge and stained Ge on Si " N. Fernando, T. Nunley; A. Ghosh, C. M. Nelson, J. Cooke; A. Medina, Chi Xu, Jose Menendez, John Kouvetakis, and Stefan Zollner, *Applied Surface Science* **http://dx.doi.org/10.1016/j.apsusc.2016.09.019 in print on line, September 2016**.

[236] "Molecular epitaxy of pseudomorphic $Ge_{1-y}Sn_y$ (y=0.06-0.17) materials and devices on Si/Ge at ultra-low temperatures via reactions of Ge_4H_{10} and SnD_4" P.M. Wallace, Chi Xu, C.L. Senaratne, P. Sims, J. Kouvetakis, and J. Menéndez, *Semiconductors Science and Technology* **32**,025093 1-10 (2017).

[237] "Observation of Fermi-level singularities in the optical dielectric function of highly doped *n*-type Ge" C. Xu, N.S. Fernando, S. Zollner, J. Kouvetakis, and J. Menéndez to *Physical Review Letter,* **under revision and most likely to be published in 2017**.

[238] “Synthesis and characterization of monocrystalline $GaPSi_3$ and $(Si)_{5-2y}(GaP)_y$ with diamond like structures via epitaxy driven reactions of molecular hydrides”. Patrick E. Sims, Chi Xu, Christian D. Poweleit, Jose Menendez, John Kouvetakis **(submitted to Chemistry of Materials)**

[239] “Investigation of hydrogen inductively coupled plasma treatment effect for $Ge_{0.938}Sn_{0.062}$/Ge/Si film using photoreflectance spectroscopy” Hyun-Jun Jo, Jong Su Kim, Mee-Yi Ryu, Yung Kee Yeo , John Kouvetakis **(submitted to Thin Solid Films)**

Invited and contributed talks from 2006-2016

2006

1. **Contributed**: D'Costa, V., Menendez, J., Tolle, J, Kouvetakis, J., "Structural, vibrational, and electronic properties of ternary SiGeSn alloys" National Meeting of the American Physical Society, 03/2006.
2. **Invited:** Kouvetakis, J., "New molecular routes to materials synthesis" Voltaix Corporation, 06/2006.
3. **Invited**: Kouvetakis, J., "Si-Ge-Sn based modulators and photodetectors" Intel Corporation Santa Clara, 08/2006.
4. **Invited:** Kouvetakis, J., "Sn containing group IV semiconductors; New platforms for optoelectronic integration with Si" International conference on compound semiconductors/Vancouver Canada
5. **Invited** Soref, R., Kouvetakis, J., Menendez, J., "New IR technologies based on SiGeSn", Materials Research Society Fall Meeting, Boston 2006.
6. **Contributed**: Yamada-Takamura, Y., Wang, Z., Fujikawa, Y., Xue, Q., Sakurai, T., Tsong, I.S.T., Kouvetakis, J., Tolle, J. "Surface and interface studies of GaN growth on ZrB_2/(0001)/Si(111)" National Meeting of the American Physical Society, 03/2006.

2007

1. **Invited:** November 29-30, 2007, AFOSR/AFRL Nanophotonics Meeting, Boston MA, "Si laser materials based on group IV alloys", J. Kouvetakis.
2. **Contributed:** October 21-25, 2007, 20th Annual Meeting of the IEEE-LEOS Laser and Electro-Optics Society, Lake Buena Vista FL, "Photoresponse at 1.55 um in GeSn epitaxial films grown on Si", R. Roucka, S.-Q. Yu, J. Tolle, Y. Fang, S.-N. Wu, J. Menéndez and J. Kouvetakis.
3. **Contributed:** October 19, 2007, American Physical Society Four Corners Section, Flagstaff AZ, "Photocurrent measurements on novel group IV semiconductor alloys", J. Mathews, R. Roucka, Shui-Qing Yu, J. Tolle, J. Kouvetakis and J. Menendez.
4. **Contributed**: July 4, 2007, "Depth profiling of Mo/Si multi-nano-layers by DSIMS and HRTEM", Babor P., Potocek M., Voborny S., Polcak J., Prusa S., Kolibal M., Spousta J., Dittrichova L., Sobota J., Bochnicek Z., Roucka R., Kouvetakis J., Sikola T.
5. **Contributed:** September 20, 2007, 7th International Conference of Nitride Semiconductors ICNS-7, Las Vegas NV, "Thermoelastic and optical properties of hybrid boride templates on Si for nitride integration", R. Roucka, J. Kouvetakis et al.
6. **Contributed:** March 5, 2007, American Physical Society, Denver CO, "Effect of nitridation on the molecular beam epitaxy growth of GaN on ZrB2(0001)/Si(111)", Yukiko Yamada-Takamura, Z.T. Wang, Y. Fujikawa, T. Sakurai, Q.K. Xue, J. Tolle, J. Kouvetakis, I.S.T. Tsong.
7. **Invited:** Tuesday August 21, 2007, American Chemical Society National Meeting, Boston MA, "Sn-based group IV semiconductors: New platforms for opto- and microelectronics on silicon", J. Kouvetakis and J. Menendez.
8. **Invited:** August 30, 2007, Joint ACS/AIChE Rocky Mountain Regional Meeting, Denver CO, "Advances in Si-Ge-Sn materials science and technology", J. Kouvetakis.

9. **Invited:** September 20, 2007, IEEE, International Conference on Silicon Photonics, Tokyo, Japan, "Growth and applications of C-Si-Ge-Sn systems", J. Kouvetakis.

10..**Invited plenary lecture:** July 11, **2007**. ICCOC-GTL-2007 (international conference on Ge, Sn and Pb), Galway Ireland, "Ge/Sn-based Group-IV Semiconductors", J. Kouvetakis.

11. **Invited:** March 2007, ASM America Inc., Phoenix AZ, "Development of Ge rich Si-Ge technologies for high mobility applications", J. Kouvetakis.

2008

1. **Invited**: November 20, 2008**,** AFOSR MURI Program Review, MIT Cambridge MA, "Recent progress in Si-Ge-Sn materials science", J. Kouvetakis.
2. **Invited:** November 14, 2008, Arizona Workshop on Renewable Energy, "Independently tunable electronic and structural parameters in ternary Group IV semiconductors for optoelectronic applications", J. Kouvetakis.
3. **Invited:** November 14, 2008, The 5th International Symposium on Advanced Science and Technology of Silicon Materials, Kona Hawaii, "Independently tunable electronic and structural parameters in ternary Group IV semiconductors for optoelectronic applications", J. Kouvetakis.
4. **Invited:** October 15, 2008, ECS Pacific Rim Meeting, Honolulu Hawaii, "Epitaxial Si-Ge-Sn materials for Si-based optoelectronic applications", J. Kouvetakis.
5. **Invited:** October 2, 2008, Symposium for Interconnect Focus Group at Georgia Tech, "Optical materials and devices based on group IV alloys containing Sn", R. Roucka, J. Kouvetakis et al.
6. **Contributed**: July 27-August 1, 2008, 29th International Conference on the Physics of Semiconductors, Rio de Janeiro, Brazil, "Transport properties of doped GeSn alloys", V. R. D'Costa, J. Tolle, J. Xie, J. Menéndez and J. Kouvetakis.
7. **Contributed**: July 27-August 1, 2008, 29th International Conference on the Physics of Semiconductors, Rio de Janeiro, Brazil, "Group-IV semiconductors incorporating Sn", V. R. D'Costa, J. Tolle, J. Xie, J. Menéndez and J. Kouvetakis.
8. **Invited:** May 11, 2008, 4th International SiGe Technology and Device Meeting, Hsinchu Taiwan, "Recent advances in Si-Ge-Sn/Si Materials", J. Kouvetakis.
9. **Invited:** April 9, 2008, California Institute of Technology, "Recent advances in SiGeSn/Si materials", J. Kouvetakis.
10. **Invited:** March 2, 2008**,** Stanford University (Materials and Electrical Engineering), "Advances in SiGeSn/Ge technology", J. Kouvetakis.
11. **Invited:** February 12, 2008, University of Southern California (USC), Los Angeles CA, "Sn-based group IV semiconductors: New platforms for opto- and microelectronics on silicon", J. Kouvetakis.

2009

1. **Invited:** J. Kouvetakis, R. Roucka, "Recent Advances in Si-Ge-Sn/Si Materials" IEEE Photonics, Anatalia, Turkey, 10/2009.
2. **Invited:** J. Kouvetakis "Advanced Si-based Semiconductors for energy and photonic application" GADEST 2009. Templin, Germany, 9/2009.
3. **Invited:** J. Kouvetakis and R. Roucka, "GeSn growth and prototype device processing" MIT, AFOSR Silicon-Based Photonic Technologies, 11/2009.

4. **Invited:** J. Kouvetakis, "Advanced semiconductors for photovoltaics" DOE review conference on solar technologies, Denver Colorado, 03/2009.
5. **Invited:** J. Matthews, R. Roucka, J. Kouvetakis, "GeSn Photodiodes" Interconnect Focus Center, Georgia Tech, Atlanta, 9/2009.
6. **Contributed:** J. Mathews, J. Kouvetakis, et. al. "Ge and GeSn Materials for Integrated Photonics" APS Four Corners 2009, Colorado School of Mines, Golden, CO 10/2009.

2010

1. **Contributed**: Mathews, J.; Kouvetakis,et al .. "Near IR photodiodes based on Ge1-ySny alloys" Electrochemical Society Meeting, Las Vegas Nevada, October 15, 2010.
2. **Invited:** Chizmeshya, A. V. G.; Kouvetakis, J.. "Practical strategies for tuning optical, structural and thermal properties in group IV ternary semiconductors. Electrochemical Society Meeting, Las Vegas Nevada, October 14, 2010.
3. **Invited**: Kouvetakis, J.; Tolle, J.; Mathews, J.; Roucka, R.; Menendez, J. "Si-Ge-Sn technologies" Electrochemical Society Meeting, Las Vegas Nevada, October 14, 2010.
4. **Contributed** : Beeler, Richard; Weng, Change; Tolle, John; Roucka, Radek; Mathews, Jay; Ahmari, David A.; Menendez, Jose; Kouvetakis, John. "Growth of InGaAs via Ge-based virtual substrates". Electrochemical Society Meeting, Las Vegas Nevada, October 15, 2010..
5. **Invited**: J. Kouvetakis Gordon Research Conference in Solid State Chemistry, "Advances in SiGeSn/Si technology: from molecules and materials to prototype devices" August 6, 2010, Colby-Sawyer College, New London, NH.
6. **Contributed**: Mathews, Jay: Menendez, Jose; Kouvetakis, John et al. "Germanium p-i-n photodiode on silicon". Photonics West 2010, January 23-28, San Francisco CA.
7. **Invited** : J. Kouvetakis, Air-Force Institute of Technology, Wright Patterson Air Force Base, "Advances in SiGeSn/Si Technologies" October 29, 2010 .
8. **Invited** : J. Kouvetakis "Optical properties and device performance of SiGeSn on Si" AFOSR Nanophotonics & Quantum Computing Program Review December 3, 2010 Boston.
9. **Invited**: J. Kouvetakis "Advances in SiGeSn/Si Technologies: from molecules and Materials to prototype devices" University of Washington, Materials Science and Engineering May 10, 2010
10. **Invited**: J. Kouvetakis and R. Roucka "Advanced Semiconductor Materials for Breakthrough Photovoltaic Applications", DOE Solar Program Washington DC, May 25, 2010.
11. **Invited:** J. Kouvetakis "Silicon on Gd_2O_3 buffered Si(111) for silicon on insulator applications" Translucent Inc., Palo Alto CA November 5, 2010.

2012

1. **Invited:** "Optical properties of next generation Si-Ge-Sn materials and. International Photonics and Optoelectronics Meeting prototype devices". Wuhan University China, November 1, 2012.
2. Electrochemical Society National Meeting Hawaii Ge1-x-ySixSny photodiodes with 1 eV optical gaps grown on Si(100) and Ge(100) platforms, R. Beeler, J. Menendez, and J. Kouvetakis October 10, 2012.

3. Electrochemical Society National Meeting Hawaii : Synthesis of monocrystalline silicon-like (III-V)-Si semiconductors: structural and optical Properties, A. Chizmeshya, J. Kouvetakis, T. Watkins, R. Beeler, and J. Menendez. October 10, 2012
4. Electrochemical Society National Meeting Hawaii: GeSn Alloys on Si Using Deuterated Stananne and Higher-Order Germanes: Synthesis and Properties" G. Grzybowski, J. Kouvetakis, and J. Menendez October 11, 2012.
5. **Invited:** European Conference and Exhibition on Optical Communication, "SiGeSn photodiodes with tunable band gaps integrated directly on Si and Ge platforms"**,** 11-16-12, Amsterdam.
6. Electrical characterization of SiGeSn grown on Ge substrate using ultra high vacuum chemical vapor deposition Mo Ahoujja, S. Kang, M Hamilton, Y.K. Yeo, J. Kouvetakis, J. Menendez b Tuesday, February 28, 2012 APS March Meeting 2012.
7. **Invited:** J. Kouvetakis, R. Beeler Photoluminescence and electroluminescence in Ge1-ySny(100) alloys IEEE Photonics 09/2011 (London UK)

2013

1. **Contributed:** Electrical properties of p-Ge and p-GeSn materials grown on Si substrates. Thomas Harris Yung Kee Yeo, R. Beeler, Mee Yi Ryu and J. Kouvetakis, March 22, 2013. American Physical Society Spring Meeting
2. **Invited:** Synthesis and properties of Si-Ge-Sn materials and devices grown by CVD, J, Kouvetakis and R.T. Beeler 2013 China Photovoltaic Conference (SEMI 2013 Solaron). March 21 Shanghai China
3. **Invited:** Synthesis and properties of Si-Ge-Sn materials and devices grown by CVD, J, Kouvetakis Fukuoka Japan on June 4, 1013 at the 8th International Conference on Silicon Epitaxy and Heterostructures (ICSI -8)

2014

1. Electronic structure of Ge1−*y*Sn*y* and $Ge_{1-x-y}Si_xSn_y$ alloys from optical and electro-optical measurements (APS March Meeting Denver Co March 4, 2014). James Gallagher, Charutha Senaratne, Chi Xu, Dough Bopp, J. Kouvetakis and J. Menendez.
2. High resolution EELS study of novel semiconductor alloys $Ge_{1-x-y}Si_xSn_y$ and $AlPSi_3$, L.Jiang, T. Aoki, J. Kouvetakis**,** APS March Meeting Denver Co March 4, 2014).
3. "Structural and thermochemical aspects of (III-V)IV3 material assembly form first principles" A.V.G. Chizmeshya and J. Kouvetakis APS March Meeting Denver Co March 6, 2014).
4. Optical and structural properties of III-V)x(IV)5-2x alloys Jose menendez, Patrick Sims, Liying Jiang and J. Kouvetakis, APS March Meeting Denver Co March 5, 2014.
5. Invited: APS March Meeting Denver Co March 5, 2014 Session Chair for Session T45: Semiconductors: Thermodynamic & Transport Properties II
6. Contributed:Strain measurements of Ge epilayers on Si by Spectroscopic Ellipsometry, A. Ghosh, N. Fernando, A.A. Medina, C.M. Nelson, S. Zollner, S.C. Xu , J. Menendez, J. Kouvetakis, APS March Meeting Denver Co March 4, 2014.
7. Contributed: Optoelectronic characterization of Si3AlP and applications Sachit Crover, Patrick Sims, S. Choi, Graig Perkins, Jian V. Li, Andrew Norman, J. Kouvetakis, Paul Strandis and David Young Spring Meeting san Francisco MRS meeting April 23,2014.

8. **Invited: "**Si based semiconductors in the SiGeSn system and (Si)5-2y(III-V)y analogs" Spring Meeting San Francisco MRS meeting April 23,2014
9. **Invited:** (ISTDM) "Epitaxy and optical properties of Si-Ge-Sn grown by CVD of nonconventional Si/Ge/Sn hydrides". International Si-Ge technology and device meeting June 4, 2014 Singapore
10. ISTDM International Si-Ge technology and device meeting (ISTDM) June 4, 2014 Singapore. "Compositional dependence of optical interband transition energies in GeSn and GeSiSn alloys" Chi Xu, Charutha L. Senaratne, John Kouvetakis, and José Menéndez submitted to Solid State Electronics
11. "Atomic Scale Studies of Structure and Bonding in $AlPSi_3$ Alloys Grown Lattice-matched on Si(001)" Microscopy and Microanalysis T. Aoki, L. Jiang, A. V. G. Chizmeshya, J. Menéndez, J. Kouvetakis and David J. Smith, Microscopy and Microanalysis conference, August 6, 2014
12. "High resolution EELS study of $Ge_{1-y}Sn_y$ and $Ge_{1-x-y}Si_xSn_y$ alloys" L. Jiang, T. Aoki, J. Kouvetakis, and J. Menéndez. Microscopy and Microanalysis Conference, Student Awardee High Resolution EELS, August 5, 2014.
13. "Group IV semiconductors with Sn: band gap studies and optical properties" ICPS International conference physics of semiconductors Austin Texas Wednesday, August 13 10:20 - 12:20, 2014. Jose Menendez, J. Kouvetakis et al.
14. "A New Class of III-V/Group-IV Semiconductor Alloys Based on Molecular Building Blocks with Bulk Crystal Stoichiometry" Patrick Sims, Liying Jiang, Toshiro Aoki, Andrew Chizmeshya, John Kouvetakis, Jose Menendez. ICPS International conference physics of semiconductors Austin Texas Wednesday, August 12 2014.
15. **"**Characterization of $Ge_{1-x-y}Si_xSn_y$ ternary alloys – comparison of CVD and MBE growth" B. Claflin, A. M. Kiefer, R. T. Beeler, G. Grzybowski, J. Menéndez, and J. Kouvetakis. Electrochemical Society Conference, October 2014, Cancun Mexico.
16. **Invited:** "Development of Si-Ge-Sn semiconductors and related $(Si)_{5-2y}(III-V)_y$ systems" J. Kouvetakis. Nanoscience seminar, ASU September 2015.

2015

1. "Suppressed Incomplete Ionization of Shallow Donors in Germanium", J. Menendez, C. Xu, C. Senaratne, J. Kouvetakis, Abstract: L14.00008, March 4, 2015 APS March Meeting San Antonio, Texas
2. "GeSn pin diodes: from pure Ge to direct-gap materials" Jose Menendez , Chi Xu , Charutha Senaratne , John Kouvetakis, L14.00010 March 4, 2015. APS March Meeting San Antonio, Texas
3. "Doping and strain dependence of the electronic band structure in Ge and GeSn alloys" C. Xu, J. Gallagher, C. Senaratne, N. Fernando, S. Zollner, J. Kouvetakis, J. Menendez, Abstract: L14.00011, March 4, 2015m APS March Meeting San Antonio, Texas.
4. "Temperature dependent band gaps of GeSiSn alloys grown on Ge buffered Si substrates", N. Fernando, T.N. Nunley, S. Zollner, C. Xu, J. Menendez and J. Kouvetakis Abstract: L15.00012, March 4, 2015 APS March Meeting San Antonio, Texas.

5. "Photoluminescence measurements of high Sn-content GeSn and GeSiSn grown on Ge-buffered Si", Yung Kee Yeo, Buguo Wang, Mee-Yi Ryu, J. Kouvetakis, Abstract: L15.00015 March 4, 2015, APS March Meeting San Antonio, Texas.
6. "New GeSi doping strategies based on P(SiH3)3 for next-generation CMOS technologies, A. Chizmeshya, C. Xu, James Gallagher, P. Sims, D. Smith, J. Menendez and J. Kouvetakis, Abstract: Q14.00005 March 4, 2015, APS March Meeting San Antonio, Texas .
7. "Crystalline $(Al_{1-x}B_x)PSi_3$ and$(Al_{1-x}B_x)AsSi_3$ tetrahedral phases", P. Sims , A. White, T. Aoki, J. Menendez and J. Kouvetakis Abstract: T12.00005, March 4, 2015, APS March Meeting San Antonio, Texas.
8. "Influence of device microstructure on the optical properties of Ge1-ySny (y = 0-0.11) LEDs produced by next generation deposition methods, JD Gallagher, T Aoki, P Sims, J Menendez, J Kouvetakis, Microscopy and Microanalysis conference Portland Oregon Thursday, Aug 6, 2015.
9. "Atomic scale structure and bonding configurations in monocrystalline Al1-xBxPSi3 alloys grown lattice matched on Si(001) platforms, P. Sims, T Aoki, J Menéndez, J Kouvetakis, Microscopy and Microanalysis conference, Portland Oregon Thursday, Aug 6, 2015.
10. "Optical Properties of Si-Integrated Group-IV Light Emitting Diodes" Abstract: D6.00006 October 16, 2015, James Gallagher, Charutha Senaratne, Chi Xu, J. Kouvetakis, J. Menendez APS Four Corners Tempe
11. "Determination of E_0 band gaps of Ge-rich GeSi films using UV-Vis ellipsometry", C. Xu, J. Gallagher, C. Senaratne, J. Kouvetakis, J. Menendez, Abstract: E6.00001 : October 16 2015, APS Four Corners Tempe Az.
12. "CMOS compatible *in-Situ n*-type doping of Ge using new generation doping agents $P(MH_3)_3$ and $As(MH_3)_3$ (M=Si, Ge)" *C.* Xu J. D. Gallagher C. Senaratne, P. Sims, J. Kouvetakis and J. Menendez, October 12, 2015, 228 ECS Meeting Phoenix Arizona
13. "Crystalline tetrahedral phases $Al_{1-x}B_xPSi_3$ and $Al_{1-x}B_xAsT_3$ (T = Si, Ge) via reactions of $Al(BH_4)_3$ and $M(TH_3)_3$ (M = P, As)", P. Sims T. Aoki, J. Menendez, and J. Kouvetakis, October 13, 2015, 228 ECS Meeting Phoenix Arizona.
14. "Doping of Direct Gap $Ge_{1-y}Sn_y$ Alloys to Attain Electroluminescence and Enhanced Photoluminescence" *C. L. Senaratne, J. D. Gallagher, C. Xu, P. Sims, J. Menendez, and J. Kouvetakis*, October 14, *2015,* 228 ECS Meeting Phoenix Arizona.
15. "Measurement of recombination lifetimes in Gesn alloys", E. Erdman, C. Senaratne, J. Menendez, J. Kouvetakis, and J. Mathews, October 14, 2015, 228 ECS Meeting Phoenix Arizona.
16. "Measurement of optical emission from GeSn waveguides", Y. Zhao, J. Gallagher, Z. Li, I. Agha, J. Menendez, J. Kouvetakis and J. Mathews, October 14, 2015, 228 ECS Meeting Phoenix Arizona.
17. "Doping of direct gap $Ge_{1-y}Sn_y$ alloys to attain electroluminescence and enhanced photoluminescence" C. L. Senaratne, J. D. Gallagher, C. Xu, P. Sims, J. Menendez, and J. Kouvetakis, October 14, 2015, 228 ECS Meeting Phoenix Arizona.

2016

1. Optical and Electrical Properties of $Ge_{1-y}Sn_y$ and $Ge_{1-x-y}Si_xSn_y$ Direct Bandgap Semiconductors Grown on Si and Ge-Buffered Si Substrates," Yung Kee Yeo, Thomas R. Harris, Mee-Yi Ryu, Buguo Wang, and John Kouvetakis. Presented (a) 20th International Vacuum Congress (IVC-20) on 21-26 August 2016 in Busan, Korea, (b) Dongguk University, Seoul, Korea (8/29/2016), (c) Kangwon National University, Chuncheon, Korea (8/31/2016) and (d) Inha University, Incheon, Korea (9/1/2016).

2. J Mathews, Z Li, Y Zhao, JD Gallagher, I Agha, J Menéndez, J Kouvetakis, "Toward GeSn lasers" Symposium on SiGe, Ge, and Related Materials: Materials, Processing, and Devices 7-PRiME 2016, 230th Electrochemical Society Meeting, October 2016 Honolulu Hawaii.

3. "Room temperature lasing in GeSn alloys: A path to CMOS compatible lasers" Li Zayrui, Zhao Yun, Gallager James, Manendez Jose, Kouvetakis John, and Mathews Jay, American Physical Society Meeting 2016.

4. "Group-IV Infrared Light Emitting Diodes on Si", James Gallagher**,** Charutha Senaratne, Chi Xu, John Kouvetakis, Jose Menendez, Materials Research Society (MRS) Spring 2016 Meeting in Phoenix, AZ, March 30, 2016.

5. "Record-Low Resistivity in n-type Ge by Sb In Situ Doping", Chi Xu**,** Charutha Senaratne, James Gallagher, John Kouvetakis, and Jose Menendez, Materials Research Society (MRS) Spring 2016 Meeting in Phoenix, AZ, March 31, 2016.

6. "Tuned $Ge_{1-y}Sn_y$ Diode Designs for Investigating the Effect of Strain Relaxation on Electroluminescence". C. L. Senaratne, J. D. Gallagher, P. Wallace, J. Menéndez, and J. Kouvetakis, Materials Research Society (MRS) Spring 2016 Meeting in Phoenix, AZ, March 30, 2016.

7. "Temperature dependence of the dielectric function of tensile strained Ge epilayer on Si substrate using spectroscopic ellipsometry" Nalin S. Fernando*,* T. Nathan Nunley*,* Ayana Ghosh, Jacqueline Cooke*,* Amber A. Medina*,* Chi Xu. 7th International Conference on Spectroscopic Ellipsometry (ICSE-7), June 10, 2016.

SERVICE ACTVITIES 2016

- Budget and Personnel Committee (SMS)
- Graduate Programs Committee (SMS)
- Committee on Valley Connections (SMS)
- I continue to review papers for Chemistry of Materials, Applied Physics Letters, Semiconductor Science and Technology and IEEE journals etc..