



Professor Mercouri G. Kanatzidis
Professor, Department of Chemistry,
Northwestern University
USA

November 24, 2017

Albert Einstein Award Committee
The World Cultural Council
wcc@prodigy.net.mx

Dear WCC Awards Selection Committee

It gives me great pleasure to nominate **Mercouri Kanatzidis** of Northwestern University for the “**Albert Einstein**” **World Award of Science**. Mercouri Kanatzidis is a brilliant academician, imaginative scientist, and prolific scholar, who thinks deeply and applies himself with tremendous focus to solving important chemical problems. He has demonstrated exceptional creativity, productivity, energy, and originality, and has made ground-braking contributions in the area of energy materials. Kanatzidis projects a huge footprint in the field of new materials design. He has designed materials with breakthrough properties in two areas of energy conversion: heat to electricity (nanostructured thermoelectrics) and solar to electricity (perovskite halide photovoltaic materials). He belongs to that elite group of scientists who leads the way in developing exciting new classes of technologically important materials.

Kanatzidis’ accomplishments have had major impact on contemporary materials science and his contributions span several important areas. In particular, his seminal work in chalcogenide chemistry over the past 25 years led to new ideas for the synthesis and application of chalcogenides.

Kanatzidis has made contributions to the advancement of thermoelectric materials for energy conversion. His landmark achievement is the discovery of nanostructured thermoelectrics that broke 4-decade-old efficiency records. Thermoelectrics are semiconductors that convert waste heat into electricity. By harvesting waste heat, thermoelectric materials can save energy in many thermal processes including automobiles helping to reduce CO₂ emissions. When applied to harvesting waste heat from automobile exhaust, the energy savings enabled by the thermoelectric materials help to increase gas mileage, thereby saving fuel. He has contributed to deeper fundamental understanding of these thermoelectric process and opened paths to further breakthroughs and unprecedented efficiencies.

Kanatzidis’ nanostructured thermoelectrics have had a revolutionary impact and they are now the new paradigm followed by researchers worldwide. He has changed the way thermoelectric materials are designed and influenced how the scientific and technological community thinks about them.

An efficient thermoelectric should exhibit the highest thermoelectric figure of merit, ZT , at the temperature of operation (T). Maximizing $ZT = (S^2\sigma/\kappa)T$ involves the simultaneous manipulation of thermopower S , electrical conductivity σ , and thermal conductivity κ . The higher the ZT , the greater the conversion efficiency. It is difficult, however, to optimize all three properties because of interdependence. The main strategy for improving these materials—and thereby increasing ZT —has been to reduce their thermal conductivity while maintaining, or increasing, their electrical conductivity. The most effective strategy for achieving this was developed by Kanatzidis and is called “nanostructuring.”

In a sequence of several high impact-reports on new materials e.g., $\text{AgPb}_m\text{SbTe}_{2+m}$ ($\text{ZT} \sim 1.6$, n-type, *Science* 2004), PbTe-PbS ($\text{ZT} \sim 1.7$, p-type, *Nature Chem*, 2011) and recently PbTe-SrTe ($\text{ZT} \sim 2.2$ *Nature*, 2012) Kanatzidis has revolutionized the field. These breakthroughs represent a 100% improvement over the state-of-the-art. It is the remarkably low thermal conductivity of these systems that makes them so promising. He showed that these materials possess coherently embedded nanodots in PbTe (a phenomenon called *endotaxy*). In endotaxy, the nanodots exhibit lattice-matching with the surrounding matrix in all space directions. Kanatzidis showed that the nanodots could efficiently scatter heat carrying phonons (greatly lowering the thermal conductivity) without disturbing electron flow through the materials (allowing high electrical conductivity). The mass contrast between the nanodots and the matrix is responsible for the phonon scattering and the endotaxy for the high electron mobilities. To disrupt the greatest possible percentage of phonons, Kanatzidis implemented a three-tiered strategy, successively aimed at disrupting the propagation of phonons with *short*, *medium*, and *long* mean free paths. These comprise a collection of hierarchically structured all-length scale materials with atomic, nanoscale and mesoscale control. This all-scale approach is paradigmatic, as it applies to all thermoelectrics and provides a ZT of 2.2, the highest to date. In another breakthrough reported in *Nature* in 2014 and in *Science* in 2016, Kanatzidis described how a surprising material, SnSe, breaks the record again at $\text{ZT} \sim 2.6$.

Kanatzidis' work has provided deeper fundamental understanding by showing how interfaces of a second phase, embedded in nanoscale size in a matrix phase, can lower dramatically the thermal conductivity. His work also point to a way forward to future advances by demonstrating how many concepts for raising thermoelectric performance (such as band alignment and band structure engineering) can be integrated with the nanostructuring concept to boost performance. The emergence of nanostructured thermoelectrics opened a path to commercialization of thermoelectric generators for automotive and other application now under way.

Please provide a description of the Candidate's major breakthrough in the field of Energy Alternatives to Petroleum use in Transportation - up to 2,000 characters about 300 words

Thermoelectric materials allow the direct conversion between thermal and electrical energy, and can therefore recover some of the energy which ordinarily is lost as waste heat. The major contributor to waste heat in the transportation sector is fuel combustion, where only 25% of the fuel's energy ends up providing useful energy. The remaining 75% is lost out the exhaust pipe. By recovering some of this lost thermal energy, vehicle mileage can be increased and carbon dioxide emissions reduced. By utilizing a portion of the lost thermal energy to charge the battery instead of using an alternator (a source of drag on the engine) the overall fuel economy can be increased by about 10%. Depending on the engine load the exhaust temperatures after the catalytic converter reach about 300-500 degrees Centigrade. The new materials developed by Professor Kanatzidis are optimized for this temperature range, thus enabling the creation of thermoelectric generators that are ideal for such applications. Thermoelectric generators utilizing these new materials are small, have no moving parts, and are relatively efficient at these temperatures.

Breakthroughs

2004: Developed new materials $\text{AgPb}_m\text{SbTe}_{2+m}$ wit $\text{ZT} \sim 1.6$ at 700K, n-type, (2004 *Science*). These materials are nanostructured and have very low thermal conductivity. This is the first demonstration that ZT of bulk materials can exceed 1 and this is enabled by nanostructuring. For first tow years results is treated with

some skepticism given the long held belief that $ZT=1$ is a practical limit for thermoelectric materials. After confirmation by other laboratories in China, the field blooms rapidly around the world's triggering breakthroughs elsewhere.

2011: By 2011 nanostructuring is established as the new paradigm for improving thermoelectric materials. In a paper (*Nature Chemistry*) the concept of combining nanostructuring and band alignment is demonstrated, leading to a ZT breakthrough of 1.7 at 800K.

2012: The all-scale architecting of PbTe thermoelectric material is shown to afford a ZT of 2.2, breaking the barrier of 2 for the first time (*Nature*).

2014: A new material breakthrough (*Nature*) describes a surprising material, undoped SnSe, which breaks the record again with a ZT of 2.6.

2016/2017: The ZT record is again broken (2016 *Science*) by demonstrating p-type doping in SnSe.

Breakthrough in solid-state perovskite solar cells. Kanatzidis has demonstrated that the solid-state semiconductor CsSnI_3 is an ideal replacement for the iodide liquid electrolyte in dye-sensitized solar cells. This represents a most striking and disruptive advance that has led to the development of tin-based perovskite iodides as photovoltaic materials. Since his May 2012 publication in *Nature* (over 1000 citations at the time of this writing) on the uses of R_2SnI_6 as a key component of photovoltaic (PV) materials, related lead-based perovskite iodides developed by others have become record-setters for solution-processable PVs with efficiencies approaching 23%. Many groups and several companies have changed their PV research directions completely as a result of Kanatzidis's contributions.

In addition to being a leading figure in inorganic chemistry, Kanatzidis enthusiastically promotes the field by encouraging young academics to become actively involved. He has mentored approximately 45 PhD students and over 80 postdocs.

Mercouri Kanatzidis has changed the way we think about and design new energy conversion materials. He has developed the intellectual and practical basis for a new field of science, nanostructured thermoelectrics. In this field and in photovoltaics, his work has meaningful impacts on clean energy, environment and sustainability. The bulk of his work is described in over 1100 peer-reviewed research publications. He is a consummate scholar and one of the most gifted inorganic chemists I have ever encountered, with extraordinary creativity and intuitiveness. His landmark accomplishments in every way merit the accolade of the prestigious **"Albert Einstein" World Award of Science**.

Yours sincerely



Sir Fraser Stoddart | 2016 Nobel Laureate in Chemistry | Board of Trustees Professor of Chemistry

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OMAR M. YAGHI
JAMES AND NEELTJE TRETTER CHAIR
PROFESSOR OF CHEMISTRY

CO-DIRECTOR
KAVLI ENERGY NANOSCIENCES INSTITUTE



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November 29, 2017

World Cultural Council
Albert Einstein Award Selection Committee
Consejo Cultural Mundial
A. Postal 10.1083
Col. Lomas de Chapultepec
C.P. 11002 México, D.F.
MEXICO

Dear Selection Committee Members:

I am writing to support Prof. Mercuri Kanatzidis for the 2018 World Cultural Council Einstein Prize in Science. I have known Prof. Kanatzidis's work for the last thirty years. I have followed his work over the year with admiration. Let me state at the outset that he is widely considered as one of the foremost solid-state scientists in the United States and among the 'elite' materials chemists worldwide. His work spans some of the most important energy related problems of our time where he is making groundbreaking contributions. In my letter I wish to focus on one such area, that of thermoelectric generators, where he has been at the leading front of this important and challenging area of research.

Thermoelectrics are special semiconductors, which harvest waste heat (essentially a free source of energy) from waste heat and convert it to electric energy. Thermoelectric generators have the advantages of being silent, having no moving parts, and being free from greenhouse and ozone-depleting gases. Thermoelectric technology can save enormous amount of fuel by harvesting the wasted exhaust heat from automobiles and use is as electricity to enhance the vehicle's propulsion. Kanatzidis' landmark achievement is the development of highly efficient thermoelectric materials that broke an efficiency record that stood for over fifty years. He invented *nanostructured thermoelectrics* a new concept that involved a heterogeneous thermoelectric material in which there is a matrix and a nanophase embedded in the matrix. This concept overturned the prevailing conventional belief that homogeneous pure compounds were the only way to go in finding highly efficient materials.

The nanocomposites designed by Prof. Kanatzidis feature precipitate nanodots throughout the host matrix and reduce the thermal conductivity to extremely low values, close to those of a glass. The latter property is very important. The maximum efficiency of a thermoelectric material is governed by the figure-of-merit, zT , which is equal to $(a^2\sigma/\kappa)T$ where a is the Seebeck coefficient, T is the absolute temperature, σ is the electrical resistivity, and κ is the thermal conductivity. Thus, thermoelectric materials must have low electrical resistivity, low thermal conductivity, and a controllable carrier concentration.

In the past decade, substantial progress and innovations have been made in new materials vastly improved efficiency for use in solid-state conversion of waste heat from power plants, automobiles and solar thermal energy into useable electrical energy. Kanatzidis has been a key player in these advances through elegant materials design, selection and processing. His first truly exciting thermoelectric compounds were the very low thermal conductivity materials $\text{AgPb}_m\text{SbTe}_{2+m}$ and $\text{NaPb}_m\text{SbTe}_{2+m}$ (figure of merit $ZT \sim 1.5-1.6$). These materials were the first bulk materials to emerge (after four decades of slow progress) with a figure of merit comfortably well above the previous value of 1. This was a huge jump in conversion efficiency, caught everyone's attention, and helped to expand and grow the field of

thermoelectrics in the past ten years. Kanatzidis demonstrated that these were two phase nanocomposites and had extensive and well-defined nanostructuring in them. The nanostructuring occurring in bulk materials has been deeply influenced the renewables energy and thermoelectrics community and stimulated many experimental and theoretical studies that enable further increases in efficiency of the materials including the demonstration of device modules that can covert heat to electricity with a record of 14%.

Undoubtedly, Kanatzidis has pioneered the concept of thermoelectric performance enhancement using coherent nanostructures in semiconductors. These coherent nanostructures serve as strong phonon scatters to reduce the thermal conductivity of the host semiconductors without deteriorating their overall electrical properties. This led into the further development of a collection of new nanostructured semiconductors with thermoelectric figure of merit zT above 2 at 900K (for example his PbTe-SrTe system published in Nature in 2012, and SnSe Nature 2014, Science 2012).

Prof. Kanatzidis contributed critical new knowledge that explains how some thermoelectric materials can be designed to have an extremely low thermal conductivity without degrading the electrical properties. These are critical for the conversion of wasted heat from vehicle exhaust emissions. The technology is expected to give automobiles considerably improved fuel economy.

Overall, through creative thinking and rigorous science, Prof. Mercouri Kanatzidis has managed to make some of the most important materials in the field of thermoelectrics and his work has come to shape this important field.

Sincerely yours,

A handwritten signature in cursive script, reading "Omar Yaghi".

Omar M. Yaghi



DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY
SANTA BARBARA, CALIFORNIA 93106-9510
(805) 893-4872, stucky@chem.ucsb.edu

November 22, 2017

Selection Committee
"Albert Einstein" World Award of Science
World Cultural Council

Dear Colleagues:

It is with the greatest enthusiasm that I endorse of the nomination of Mercuri G. Kanatzidis for the "Albert Einstein" World Award of Science. Mercuri Kanatzidis is one of the most gifted synthetic inorganic chemists that I have encountered, with an extraordinary sense of creativity and intuitiveness. I have followed his career closely, partly because the research that he has done is related to my own interests, but more because I have found his scientific accomplishments to always be uniquely creative, highly insightful and at the cutting edge of solid state science.

Professor Kanatzidis creates fields. A specific example is his research on thermoelectric materials: he has uncovered a new chemistry approach for the design of thermoelectric materials with exceptionally low thermal conductivity, in which he has chemically synthesized nanoscale heterostructured thermoelectric materials with built-in phonon scattering to give low thermal conductivity along with a state-of-the-art level of electronic conductivity. This new chemistry approach includes the incorporation of nanoscale precipitates at controlled, variable doping levels into a host semiconductor matrix. The thermoelectric heterostructures that he thus creates are multi-dimensional, with both the structural and property (electron and phonon) length scales exquisitely defined to optimize the electron transport, phonon scattering, and Seebeck properties to give the highest possible thermoelectric efficacy. As described in the nomination letter, he reported in 2011-2012 that endotaxially aligned SrTe nanocrystals at concentrations as low as 4% incorporated into p-PbTe semiconductor matrix results in a remarkable thermoelectric figure of merit of 2.2 at ~ 915 K. This set a world record thermoelectric Carnot efficiency of $\sim 20\%$!

This new chemistry approach for the design of thermoelectrics opens up entirely new, previously unexplored horizons that were previously out of reach. It is a totally new scientific platform whose value is demonstrated in two publications in *Nature* (2014) and *Science* (2016), where he and his team reported another performance-record-breaking thermoelectric material, SnSe, that has a ZT of approximately 2.6. He has truly revolutionized the old field of thermoelectrics, which has been intensely studied in laboratories around the world, and transformed it into a new field with many opportunities.

In giving a rebirth to the old field, Professor Kanatzidis is enabling new technology, amplified by the fact that he has shown that the concepts that he has developed are leading to exceptional thermoelectric materials with high power-generation efficiency that are made from earth-abundant, inexpensive elements. His work on thermoelectric materials will have a major long-range impact on the commercial efficient utilization of thermal energy, including that generated in transportation applications.

Professor Kanatzidis's synthesis skills have also led to major breakthroughs in the area of mesostructured metal chalcogenide and chalcogel materials. This is also a statement of his unparalleled ability to develop new synthesis methodologies, such as the use of molten salts as solvents for solid state synthesis and solvothermal techniques, to form a broad launching platform for the creation of nanostructured materials with electronic functionality. These systems have been built with the incorporation of hierarchical multi property length scales. Out of his porous chalcogenide research has come arguably the best materials yet discovered for the separation of methane, hydrogen, and carbon dioxide. These high-surface-area, semiconducting materials open up a new dimension for separation and catalysis technology. The chalcogels, with extraordinary high surface areas of as much as 1600 m²/gm have proven to have the highest selectivities and affinities known for the cleanup of heavy metal ions.

Anyone starting to work in solid state chemistry begins by carefully studying the publications and work of Mercuri Kanatzidis. His work provides guiding underlying principles for creating new state-of-the-art performance solid state materials by design using simple processing conditions, which makes them high-impact candidates for commercial applications and enabling technologies. He is the standard by which comparison evaluations are made for scientists in the field of synthetic solid state inorganic chemistry, with his being of the highest rank. His sustained and distinguished contributions to the advancement of materials research are at the highest level, and he is most deserving of this award.

In addition to his scientific capabilities, Mercuri Kanatzidis is most highly regarded for his integrity and objectiveness, and sets a professional standard to which all scientists should aspire. He is a generous, helpful, and socially conscious individual who displays and implements a concern for both younger scientists and his peers.

Professor Kanatzidis is a national and international leader in solid state chemistry. In all respects you could find no better candidate for the "Albert Einstein" World Award of Science.

Sincerely,



Galen D. Stucky

Khashoggi Chair in Materials Chemistry
Department of Chemistry and Biochemistry
Materials Department

Resume with the grounds for nominating Professor Mercouri Kanatzidis

Breakthrough in thermoelectric materials converting waste heat to electricity

Mercouri Kanatzidis has made seminal contributions to the advancement of thermoelectric materials for energy conversion. His landmark achievement is the discovery of nanostructured thermoelectrics that broke 40-year-old efficiency records. Thermoelectrics are semiconductors that convert waste heat into electricity. By harvesting waste heat thermoelectric materials can save enormous amounts of energy in many thermal processes, including automobiles, while helping to reduce CO₂ emissions. Kanatzidis has contributed to a deeper fundamental understanding of the thermoelectric process and, in so doing, has opened paths to further breakthroughs.

Kanatzidis' nanostructured thermoelectrics have had a revolutionary impact, and they have become the new paradigm followed by researchers worldwide. He has changed the way thermoelectric materials are designed and influenced how the scientific community thinks about them. An efficient thermoelectric should exhibit the highest thermoelectric figure of merit, ZT , at the temperature of operation, T . $ZT = (S^2\sigma/\kappa)T$, and it involves the simultaneous manipulation of thermopower S , the electrical conductivity σ , and κ the thermal conductivity. The higher the ZT , the greater the conversion efficiency. It is difficult, however, to optimize all three properties because of their interdependence. The main strategy for improving these materials—and thereby increasing ZT —has been to reduce their thermal conductivity while maintaining, or increasing, their electrical conductivity. The most effective strategy for achieving increased ZT was developed by Kanatzidis and is called “nanostructuring”.

In a sustained sequence of several high-impact reports on new materials e.g., AgPb_mSbTe_m²⁺ ($ZT \sim 1.7$, n-type, *Science* **2004**, 303, 818), PbTe-PbS ($ZT \sim 1.7$, p-type, **2011**, *J. Am. Chem. Soc.* **2007**, 129, 9780; *Nature Chemistry* **2011**, 3, 160) and recently PbTe-SrTe ($ZT \sim 2.2$, *Nature* **2012**, 490, 414) Kanatzidis has revolutionized the field. These breakthroughs represent a 100% improvement over the prior state-of-the-art. The reason these new systems are so much improved is their remarkably low thermal conductivity. Kanatzidis showed that these materials possess coherently embedded nanodots in PbTe (a phenomenon called endotaxy). In endotaxy, the nanodots exhibit lattice-matching with the surrounding matrix in all space directions. Kanatzidis showed that the nanodots could efficiently scatter heat-carrying phonons (greatly lowering the thermal conductivity) without disturbing electron flow through the materials (allowing high electrical conductivity). The mass contrast between the nanodots and the bulk matrix is responsible for the phonon scattering, and the endotaxy is responsible for the high electron mobilities. To disrupt the greatest possible percentage of phonons, Kanatzidis recently implemented a three-tiered strategy, successively aimed at disrupting the propagation of phonons with short, medium, and long mean free paths. This strategy is a hierarchically structured one suitable for all-length scale materials, and with atomic, nanoscale and mesoscale control. This all-scale approach is paradigmatic since it applies to all thermoelectrics and gives $ZT \sim 2.2$, the highest recorded to date. In another advance (*Nature*, **2014**, 508, 373; *Science* **2016**, 351, 141), Kanatzidis described how a surprising material, SnSe, breaks the record again at $ZT \sim 2.6$.

Kanatzidis' work provides deeper fundamental understanding of these materials by showing how interfaces of a second phase, embedded at the nanoscale size in a matrix phase, can lower dramatically the thermal conductivity. His work also points the way forward to future advances by demonstrating how many concepts for raising thermoelectric performance (such as band alignment and band structure engineering) can be integrated with the nanostructuring concept to boost performance. The emergence of nanostructured thermoelectrics has opened up the possibility of commercialization of thermoelectric generators.

Across the world, as many as 1.5 billion people lack consistent access to electricity. Many live in remote or rural areas where it is often too difficult or too costly to transmit power using standard extensions of the power grid. The lack of access to this vital resource has hampered economic progress and is widely considered to be a major contributor to the continued poverty in these areas. The new thermoelectric materials invented by Kanatzidis have certain undeniable advantages for the application of remote and rural generation of low-cost electricity. Even the most remote and undeveloped areas typically still have some type of heat source used for cooking and providing warmth for survival. With wood fires and kerosene stoves, for example, there is inevitably a considerable amount of waste heat produced. The waste heat can be used to generate a small amount of power with off-the-shelf thermoelectric modules. This power generation may be sufficient to charge a mobile device, power a TV, computer, radio or lamp. In view of these significant developments, thermoelectric technology is now poised to contribute important advances in Africa, Southeast Asia and the Indian subcontinent.

Breakthrough in solar energy research

In 2012 Kanatzidis reported the first application of a perovskite halide material (CsSnI_3) in a TiO_2 -based dye-sensitized solar cell (DSSC). This discovery took the community by surprise since there was a long-term standing push to create solid-state DSSCs. These DSSCs, also known as Grätzel cells, are an ingenious, highly efficient, and low-cost device that uses TiO_2 as electron conductor, an organic dye as light absorber, and a liquid-based redox electrolyte as hole-transport layer. The liquid part, which was a huge flaw of previous devices, had impeded the realization of long-lasting devices. For two decades researchers have been searching for a solid version of the Grätzel cell, in which a solid absorber replaces the dye, and an inorganic solid conductor takes on the role of the liquid electrolyte. Kanatzidis solved this problem, as reported in his *Nature* in 2012 paper, by demonstrating the first all-solid-state cell based on the perovskite material $\text{CsSnI}_{2.95}\text{F}_{0.05}$ which exceeds 10% efficiency. A revolution in perovskites rapidly followed as other laboratories created lead-based cells by employing $\text{CH}_3\text{NH}_3\text{PbI}_3$ (and related PbI_3 salts) as light absorbers. Kanatzidis also invented formamidinium lead perovskite, FAPbI_3 , which forms the basis for creating the most energy-efficient cells to date, reaching efficiencies of 22%. In still another breakthrough, Kanatzidis created the first perovskite crystalline solar cells without toxic lead, as reported in *Nature Photonics* in 2014. These cells, which have efficiency levels near 8 percent, and it is expected that they could reach much higher efficiencies. The removal of toxic lead represents a breakthrough for this highly promising type of solar cell. In summary, Kanatzidis has launched the “perovskite era” with regard to low-cost solar energy materials development—a revolution in solar energy.

BIOGRAPHICAL SKETCH
Mercouri Kanatzidis, Northwestern University
2145 Sheridan Road, Evanston, IL 60208

EDUCATION AND TRAINING

Aristotle University of Thessaloniki	Thessaloniki, Greece	Chemistry	B. S.	1979
University of Michigan	Ann Arbor, Michigan	Chemistry	Ph. D.	1984
University of Michigan	Ann Arbor, Michigan	Chemistry	P. D.	1985
Northwestern University	Evanston, Illinois	Chemistry	P. D.	1987

RESEARCH AND PROFESSIONAL EXPERIENCE

2006-present	Professor, Department of Chemistry, Northwestern University (joint appointment with Argonne National Laboratory)			
1993-2006	Professor, Department of Chemistry, Michigan State University			
1991-1993	Associate Professor, Department of Chemistry, Michigan State University			
1987-1991	Assistant Professor, Department of Chemistry, Michigan State University.			

AWARDS

- Presidential Young Investigator Award, National Science Foundation, 1989-1994
- ACS Inorganic Chemistry Division Award, EXXON Faculty Fellowship in Solid State Chemistry, 1990
- Beckman Young Investigator, 1992-1994
- Alfred P. Sloan Fellow, 1991-1993
- Camille and Henry Dreyfus Teacher Scholar, 1993-1998
- Michigan State University Distinguished Faculty Award, 1998
- Sigma Xi 2000 Senior Meritorious Faculty Award
- University Distinguished Professor MSU, 2001
- John Simon Guggenheim Foundation Fellow, 2002
- Alexander von Humboldt Prize, 2003
- Morley Medal, American Chemical Society, Cleveland Section, 2003
- Charles E. and Emma H. Morrison Professor, Northwestern University, 2006
- MRS Fellow, Materials Research Society, 2010
- AAAS Fellow, American Association for the Advancement of Science, 2012
- Cheetham Lecturer Award, University of California Santa Barbara, 2013
- Einstein Professor, Chinese Academy of Sciences, 2014
- International Thermoelectric Society Outstanding Achievement Award 2014
- Materials Research Society Medal 2014
- Royal Chemical Society DeGennes Prize 2015
- Elected Fellow of the Royal Chemical Society 2015
- ENI Award for the "Renewable Energy Prize" category
- ACS Award in Inorganic Chemistry 2016
- American Physical Society 2016 James C. McGroddy Prize for New Materials
- American Physical Society Fellow 2016
- Samson Prime Minister's Prize for Innovation in Alternative Fuels for Transportation, Israel 2016
- Honorary PhD Degree University of Crete, Greece, 2017

PROFESSIONAL SERVICE AND RECOGNITION

- Editorial Advisory Board *Inorganic Chemistry*, 1994-1998
- Editorial Advisory Board *Chemistry of Materials*, 1993-2000
- Editorial Advisory Board *Journal of Alloys and Compounds*
- Editorial Advisory Board *Zeitschrift für anorganische und allgemeine Chemie*
- Editorial Advisory Board *Bulletin Korean Chemical Society* 1998-
- Editor-in-Chief: *Journal of Solid State Chemistry* 1997-
- Editorial Advisory Board *Energy and Environmental Science* 2012-
- Editorial Advisory Board *Journal of Materials Chemistry A* 2013-
- Chairman Solid State Chemistry Subdivision, American Chemical Society 1998-1999
- Organizer of Gordon Research Conference in Solid State Chemistry, 2008
- American Chemical Society, Div. of Chemical Education, Examinations Institute Cmte
- 1996 and 2003 Inorganic Chemistry Committee
- DOE and NSF Panel Reviewer 2008-2013.
- Special advisory member of the Ho-Am Prize Ho-Am Foundation, Korea
- Team led by Kanatzidis and Wasielewski discover new method for a more environmental friendly fertilizer, 2015

SOCIETY MEMBERSHIPS

American Chemical Society, American Crystallographic Association, Sigma Xi, Materials Research Society, American Association for Crystal Growth, American Physical Society

RESEARCH INTERESTS: Design and synthesis of new materials with technological impact, solid state and molecular chemistry of semiconductors, non-oxidic materials, thermoelectric energy conversion, solar energy conversion.

PUBLICATIONS > 1050 | CITATIONS > 50,000 | H INDEX 105 | PATENTS: 38

Over 500 invited presentations. Over forty plenary lectures.

SYNERGISTIC ACTIVITIES (LAST 4 FOUR YEARS)

1. Co-organizer, International Symposium on Advanced Nanoporous and Nanostructured Materials, Heraklion, Crete, September 3-4, 2015.
2. Co-organizer, Symposium on Emerging Developments in Nanomaterials for Energy Applications Inorganic Chemistry Division, ACS National Meeting, San Diego, CA, April 2014.
3. Co-organizer, DOE-BES Materials Chemistry PI meeting, Annapolis, MD, July 2012.
4. Co-organizer, Workshop on Emerging Opportunities in Nanostructured Semiconductors, Evanston, IL, June 2011.
5. Reviewer, Manuscripts: *Acc. Chem. Res.*, *Chem*, *ACS Nano*, *Angew. Chemie*, *Chem. Commun.*, *Chem Eur. J.*, *Chem.*, *Mater.*, *Chemical Science*, *Dalton Trans.*, *Inorg. Chem.*, *J. Am. Chem. Soc.*, *Nature*, *Nature journals*, *Physical Review B*, *Proc. Natl. Acad. Sci. U.S.A.*, *Science*.

GRADUATE AND POSTDOCTORAL ADVISORS IN THE PAST FIVE YEARS (NOT INCLUDING CURRENT MEMBERS)

Graduate students

1. Myung Gil Kim, Ph.D. 2012 (Stanford U, Postdoc)
2. Collin Morris, PhD 2012 (EPFL, Switzerland)
3. Melanie Francisco, Ph. D. 2012 (U. Washington)
- 4 Youngtak Oh, Ph. D. 2012 (Claflin College faculty)
5. Sandy L. Nguyen, PhD 2013 (UCLA)
6. Ronald Soriano, PhD 2014 (Pittsburgh, PA)
7. YeSeul Lee, PhD 2014
8. Yurina Shim, PhD 2014 (Indiana)
9. Rachel Korkosz, Ph D 2016 (Trinity Univ.)
10. Nicholas Calta, PhD 2016 (San Francisco, CA)
11. Alyssa Haynes, PhD 2016 (Ireland)

Postdocs

1. Daniel Shoemaker (U. Illinois Urbana, faculty)
2. In Chung (KAIST, faculty)
3. Alexander Rothenberger (KAUST, faculty)
4. John Androulakis, (Gentherm, Inc)
5. Ben Yuhas (UOP/Honeywell)
6. Ferdinand Poudeu (Univ. Michigan, faculty)
7. Maryam Shafaei-Fallah (KAUST faculty)
8. Kanishka Biswas (JNCASR, Bangalore, faculty)

GRADUATE AND POSTDOCTORAL ADVISEES:

Graduate Advisor: Dimitri Coucouvanis, (U. Michigan)

Postdoctoral Advisor: Tobin J. Marks (Northwestern University)

Total number of graduate students graduated: 55

Total number of postdocs advised: 86

List of Kanatzidis 10 most important papers

1. Hu, X. K.; Jood, P.; Ohta, M.; Kunii, M.; Nagase, K.; Nishiate, H.; Kanatzidis, M. G.; Yamamoto, A., Power generation from nanostructured PbTe-based thermoelectrics: Comprehensive development from materials to modules. *Energy & Environmental Science* **2016**, *9*, 517-529.
2. Zhao, L. D.; Tan, G. J.; Hao, S. Q.; He, J. Q.; Pei, Y. L.; Chi, H.; Wang, H.; Gong, S. K.; Xu, H. B.; Dravid, V. P.; Uher, C.; Snyder, G. J.; Wolverton, C.; Kanatzidis, M. G., Ultrahigh power factor and thermoelectric performance in hole-doped single-crystal SnSe. *Science* **2016**, *351* (6269), 141-144.
3. Tan, G. J.; Shi, F. Y.; Hao, S. Q.; Zhao, L. D.; Chi, H.; Zhang, X. M.; Uher, C.; Wolverton, C.; Dravid, V. P.; Kanatzidis, M. G., Non-equilibrium processing leads to record high thermoelectric figure of merit in PbTe-SrTe. *Nature Communications* **2016**, *7*, 12167.
4. Zhao, L. D.; Lo, S. H.; Zhang, Y. S.; Sun, H.; Tan, G. J.; Uher, C.; Wolverton, C.; Dravid, V. P.; Kanatzidis, M. G., Ultralow thermal conductivity and high thermoelectric figure of merit in SnSe crystals. *Nature* **2014**, *508* (7496), 373-377.
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Assignee(s): Michigan State University
Inventor(s): Marking, G.A.; Kanatzidis, M.G.; Liao, J.H.
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Assignee(s): Michigan State University
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Assignee(s): Michigan State University
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Assignee(s): Michigan State University; Northwestern University
Inventor(s): Kanatzidis, M.G.; Hogan, T.; Iordanidis, L.; Chung, D.Y.; Kannewurf, C.R.
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Assignee(s): BASF Aktiengesellschaft; Michigan State University
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- 8) 2008; US-7407696 (US 20060072442 A1, 2006)
Title: Phase change materials for storage media
Assignee(s): Michigan State University
Inventor(s): Kanatzidis, M.G.
- 9) 2008; US-20080145305-AL
Title: Process for the removal of metals using an open framework chalcogenide

- Assignee(s): Michigan State University
Inventor(s): Kanatzidis, M.G.; Manos, M.J.
- 10) 2009; US-7592535 (US 20070107764 A1, 2007)
Title: Silver-containing thermoelectric compounds
Assignee(s): Michigan State University
Inventor(s): Kanatzidis, M.G.; Hsu, K.-F.
 - 11) 2010; US- 7727506 (US 20080241050 A1, 2008)
Title: Semiconducting aerogels from chalcogenide clusters with broad applications, Assignee(s): Northwestern University
Inventor(s) Kanatzidis, M.G.; Bag, S.
 - 12) 2010; US-7847179 (US 20060272697 A1, 2006)
Title: Thermoelectric compositions and process
Assignee(s): Michigan State University
Inventor(s): Kanatzidis, M.G.; Androulakis, J.; Sootsman, J.R.
 - 13) 2011; US-20110042607-A1
Title: Thermoelectric compositions and process
Assignee(s): Michigan State University
Inventor(s): Kanatzidis, M.G.; Androulakis, J.; Sootsman, J.R.
 - 14) 2011; US-20110248209-A1
Title: Thermoelectric figure of merit enhancement by modification of the electronic density of states
Assignee(s): Northwestern University; Ohio State University
Inventor(s): Androulakis, J.; Gao, Y.; Girard, S.N.; Heremans, J.; Jaworski, C.; Kanatzidis, M.G.
 - 15) 2011; US-7952015 (US 20070227577 A1, 2007)
Title: Pb-Te-compounds doped with tin-antimony-tellurides for thermoelectric generators or Peltier arrangements
Assignee(s): Northwestern University
Inventor(s) Sterzel, H.J.; Kuehling, K.; Kanatzidis, M.G.; Chung, D.Y.
 - 16) 2011; US-8070959 (US 20090095684 A1, 2009)
Title: Chalcogenide compounds with a clay-like cation-exchange capacity and methods of use
Assignee(s): Northwestern University
Inventor(s) Kanatzidis, M.G.; Manos, M.; Ding, N.
 - 17) 2012; US-8143181 (US 20100292065 A1, 2010)
Title: Nonlinear optic glassy fiber, methods of making and applications of the same
Assignee(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Chung, I.
 - 18) 2012; US-8277677 (US 20100025616 A1, 2010)
Title: Mechanical strength and thermoelectric performance in metal chalcogenide MQ (M=Ge, Sn, Pb and Q=S, Se, Te) based compositions
Assignee(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Sootsman, J.R.

- 19) 2013; US-20130233377-A1
 Title: Liquid electrolyte-free, solid-state solar cells with inorganic hole transport materials
 Assignee(s): Northwestern University
 Inventor(s): Kanatzidis, M.G.; Chung, I.; Lee, B.; Chang, R.P.H.

- 20) 2013; US-8351109 (US 20120156119 A1, 2012)
 Title: Nonlinear optic glassy fibers, methods of making and applications of the same
 Assignee(s): Northwestern University
 Inventor(s): Kanatzidis, M.; Chung, I.

- 21) 2013; US-8481843 (US 20050076944-A1, 2005)
 Title: Silver-containing p-type semiconductor
 Assignee(s): Michigan State University
 Inventor(s): Kanatzidis, M.G.; Hsao, K.-F.

- 22) 2014; US-8519347 (US 20120153178-A1, 2012)
 Title: Methods and compositions for the detection of x-ray and gamma-ray radiation
 Assignee(s): Northwestern University
 Inventor(s): Kanatzidis, M.G.; Androulakis, I.; Johnsen, S.; Peter, S.C.

- 23) 2014; US-8778214 (US 20110073797-A1, 2011)
 Title: Thermoelectrics compositions comprising nanoscale inclusions in a chalcogenide matrix
 Assignee(s): Northwestern University
 Inventor(s): Kanatzidis, M.G.; Zhang, Q.; Girard, S.N.; Biswas, K.

- 24) 2014; US-8921783 (US 20140306108-A1, 2014)
 Title: Method of collecting and processing electron diffraction data
 Assignee(s): Columbia University, New York
 Inventor(s): Billinge, S.; Farrow, C.; Gorelik, T.E.; Kanatzidis, M.G.; Schmidt, M.U.

- 25) 2015; US-20150144568-A1
 Title: Column material for the capture of heavy metal and precious metal ions
 Assignee(s): Northwestern University
 Inventor(s): Kanatzidis, M.G.; Sarma, D.; Manos, E.

- 26) 2015; US-8940578 (US 20130196469-A1, 2013)
 Title: Low-temperature fabrication of metal oxide thin films and nanomaterial-derived metal composite thin films
 Assignee(s): Northwestern University, Polyera Corporation
 Inventor(s): Facchetti, A.; Marks, T.J.; Kanatzidis, M.G.; Kim, M.-G.; Sheets, W.C.; Yan, H.; Xia, Y.

- 27) 2015; US-8940579 (US 20130217180-A1, 2013)
 Title: Low-temperature fabrication of metal oxide thin films and nanomaterial-derived metal composite thin films
 Assignee(s): Northwestern University, Polyera Corporation
 Inventor(s): Facchetti, A.; Marks, T.J.; Kanatzidis, M.G.; Kim, M.-G.; Sheets, W.C.; Yan, H.; Xia, Y.

- 28) 2015; US-8974578 (US 20130295362-A1, 2013)
Title: Porous polymer networks and ion-exchange media and metal-polymer composites made therefrom
Assignee(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Katsoulidis, A.
- 29) 2015; US-9056263 (US 20110290735-A1, 2011)
Title: Chalcogenide compounds for the remediation of nuclear and heavy metal wastes
Assignee(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Mertz, J. L.; Manos, E.
- 30) 2015; US-20150295194-A1
Title: Lead-free solid-state organic-inorganic halide perovskite photovoltaic cells
Assignee(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Hao, F.
- 31) 2016; US-9181475 (US 20130320836-A1, 2013)
Title: Photoluminescent compounds
Assignees(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Chung, I.; Stoumpos, K.
- 32) 2016; US-9227186 (US 20140097141-A1, 2014)
Title: Synthesis of layered metal sulfide ion-exchangers
Assignee(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Fard, Z. H.
- 33) 2016; US-9412852 (US 20150206957-A1, 2015)
Title: Low-temperature fabrication of nanomaterial-derived metal composite thin films
Assignees(s): Northwestern University; Polyera Corporation
Inventor(s): Facchetti, A.; Marks, T.; Kanatzidis, M.G.; Kim, M.-G.; Sheets, W.C.; Yan, H.; Xia, Y.
- 34) 2016; US-9468923 (US 20150190799-A1, 2015)
Title: Porous polymer networks and ion-exchange media and metal-polymer composites made therefrom
Assignees(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Katsoulidis, A.
- 35) 2016; US-20160049568-A1
Title: Tin selenide single crystals for thermoelectric applications
Assignee(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Zhao, L.-D.
- 36) 2016; US-20160102248-A1
Title: Photoluminescent compounds
Assignee(s): Northwestern University
Inventor(s): Kanatzidis, M.G.; Chung, I.; Stoumpos, K.
- 37) 2016; US-20160211083-A1
Title: Solar cells with perovskite-based light sensitization layers
Assignee(s): Northwestern University

Inventor(s): Kanatzidis, M.G.; Chang, R.P.H.; Stoumpos, K.; Lee, B.

- 38) 2017; US-9610538 (US 20150336050-A1, 2015)
 Title: Polysulfide intercalated layered double hydroxides for metal capture applications
 Assignee(s): Northwestern University
 Inventor(s): Kanatzidis, M.G.; Ma, S.

INVITED TALKS AND PRESENTATIONS

- 140) University of Montpellier, Montpellier, France, March 1996
- 141) Institute des Materiaux de Nantes, Nantes, France, March 1996
- 142) University of Nantes, Nantes, France, May 1996
- 143) University of Caen, Caen, France, May 1996
- 144) University of Bonn, Bonn, Germany, May 1996
- 145) University of Bochum, Bochum, Germany, May 1996
- 146) University of Muenster, Munster, Germany, May 1996
- 147) University of Bielefeld, Bielefeld, Germany, May 1996
- 148) University of Duisburg, Duisburg, Germany, May 1996
- 149) Inorganic Gordon Conference, July 1996
- 150) Materials Research Society Meeting, Symposium on Solid State Inorganic Materials, Boston, MA, December 1996
- 151) University of Southern California, January 1997
- 152) Florida State University, February 1997
- 153) University of Puerto Rico, February 1997
- 154) Materials Research Society Meeting, Symposium on Thermoelectric Materials, San Francisco, CA, April 1997
- 155) Iowa State University, April 1997
- 156) High Temperature and Solid State Chemistry Conference, Ann Arbor, MI, June 1997
- 157) Central Regional ACS Meeting, Symposium on Nanostructured Materials, D. Curtis, S. Lee organizers, Midland, MI, June 1997
- 158) International Thermoelectrics Society Meeting, Dresden, Germany, August 1997
- 159) Eastman Kodak Co., September 1997
- 160) University of Texas Austin, October 1997
- 161) Texas A&M University, October 1997
- 162) NSF Workshop on Solid State and Materials Chemistry, Washington DC, January 1998
- 163) Clemson University, Clemson, SC, February 1998
- 164) Cornell University, Ithaca, NY, March 1998
- 165) Frontiers in Science Workshop for High School Teachers, April 1998
- 166) Gordon Research Conference, Lecture on Solid State Chemistry, New London, NH, July 1998
- 167) International Conference on Coordination Chemistry, Florence, Italy, September 1998
- 168) University of Minnesota, October 1998
- 169) Materials Research Society Meeting, Invited Lecture in Symposium on "Inorganic Solid State Materials", Boston, MA, Fall 1998
- 170) Oakland University, Rochester, MI, February 1999
- 171) University of North Carolina, Chapel Hill, NC, February 1999
- 172) Wake Forest University, Winston-Salem, NC, February 1999
- 173) North Carolina State University, Raleigh, NC, February 1999
- 174) Pennsylvania State University, March 1999
- 175) Exxon Research and Engineering Corp., March 1999
- 176) Rational Design of Materials, Knowledge Foundation, Philadelphia, PA, May 1999

- 177) University of Thessaloniki, June 1999
- 178) University of Crete, June 1999
- 179) International Conference on Solid State Ionics, Halkidiki, Greece, June 1999
- 180) International Conference on Thermoelectrics, Baltimore, MD, August 1999
- 181) EUCHEM Conference on the Reactivity of Microporous Materials, Plenary Speaker, Madrid Spain, September 1999
- 182) NSF Workshop in Materials Chemistry, Minneapolis, MN, October 1999
- 183) University of Notre Dame, Lecture on Advanced Thermoelectrics, South Bend, IN, December 1999
- 184) DOW Chemical Company, Lecture on Advanced Thermoelectrics, December 1999
- 185) University of California Los Angeles, Lecture on Advanced Thermoelectrics, Los Angeles, CA, January 2000
- 186) University of California Irvine, Lecture on Advanced Thermoelectrics, Irvine, CA, January 2000
- 187) University of California San Diego, Lecture on Advanced Thermoelectrics, San Diego, CA, January 2000
- 188) University of Cincinnati, Lecture on Advanced Thermoelectrics, Department of Electrical Engineering, Cincinnati, OH, February 2000
- 189) ACS National Meeting, Invited Lecture for Symposium on "Synthetic Methods in Solid State Chemistry", San Francisco, CA, March 2000
- 190) Northwestern University, Lecture on Advanced Thermoelectrics, April 2000
- 191) Materials Research Society Meeting, Lecture on Thermoelectrics, April 2000
- 192) Brandeis University, Lecture on Advanced Thermoelectrics, May 2000
- 193) Canadian Chemical Society Meeting, Symposium on Functional Solids, Calgary Canada, June 2000
- 194) 9th International Conference on Inorganic Ring Systems, Saarbruecken, Germany, July 2000
- 195) Wayne State University, Lecture on Synthesis in Liquid Aluminum, October 2000
- 196) University of Waterloo, Lecture on "Solid State Chemistry and Thermoelectrics", October 2000
- 197) University of Michigan, Lecture on "Solid State Chemistry and Thermoelectrics", February 2001
- 198) University of Windsor, Lecture on "Lamellar and Non-lamellar Nanocomposites", February 2001
- 199) Penn State University, Frontiers in Materials Lecturer, State College Lecture on "Lamellar and Non-lamellar Nanocomposites", March 2001
- 200) ACS National Meeting, Tobin Marks Awards Symposium, San Diego, CA, April 2001
- 201) ACS National Meeting, John Fackler Awards Symposium, San Diego, CA, April 2001
- 202) ACS National Meeting, Symposium on "Impact of Solid State Chemistry to Technology", San Diego, CA, April 2001
- 203) University of Michigan, Lecture on "Synthetic Adventures in Liquid Aluminum", April 2001
- 204) University of Ioannina, Lecture on New Thermoelectric Materials, Ioannina, Greece, June 2001
- 205) Lecture on 'Novel layered chalcogenides: Disorder and Superstructures Everywhere' in "From Semiconductors to Proteins: Beyond the Average Structure" in a workshop sponsored by Michigan State University, Traverse City, MI, July 2001
- 206) University of Kiel, Kiel, Germany, October 2001
- 207) University of Muenster, Muenster, Germany, October 2001
- 208) Lecture on "Novel layered chalcogenides. Disorder and superstructures everywhere" in a Workshop on Ionic Motion in Glasses, sponsored by SFB, Muenster, Germany, 2001
- 209) Lecturer in Linus Pauling Symposium to Honor Professor Tobin Marks, Portland, OR, November 2001
- 210) Kalamazoo College, Lecture on New Thermoelectric Materials, Kalamazoo, MI, November 2001
- 211) Materials Research Society Meeting, Invited Lecturer in Symposium on New Thermoelectric Materials, Boston, MA, November 2001
- 212) Invited Speaker in Workshop on Direct Energy Conversion (ONR, DARPA Sponsors), Alexandria, VA, December 2001

- 213) Case Western Reserve University, Department of Physics Colloquium, February 2002
- 214) Georgia Tech, Colloquium, March 2002
- 215) Universite de Nantes, France, June 2002
- 216) Universite Pierre et Marie Curie, 4 place Jussieu, Paris, France
- 217) University of Boudreaux, France, June 2002
- 218) Central Michigan University, Department of Physics Colloquium, November 2002
- 219) University of Michigan, Department of Physics Colloquium, January 2003
- 220) University of Muenster, "Research in New Intermetallic Compounds", Germany, February 2003
- 221) Max Planck Institute, "Role of Solid State Chemistry in Thermoelectrics Research", Stuttgart, Germany, February 2003
- 222) Haemdsarmel Kolloquium, "Phase Homologies", Dormund, Germany, March 2003
- 223) ACS National Meeting, "Phase Homologies", New Orleans, LA, March 2003
- 224) ACS National Meeting "Non-oxidic Mesostructured Solids", New Orleans, LA, March 2003
- 225) University of Aachen, "Role of Solid State Chemistry in Thermoelectrics Research", Germany, April 2003
- 226) Conference on Non-crystalline Solids, "Application of the Pair Distribution Analysis Technique", Bonn, Germany, April 2003
- 227) University of Cologne, "Role of Solid State Chemistry in Thermoelectrics Research", Germany, May 2003,
- 228) Max Planck Institute, "Role of Solid State Chemistry in Thermoelectrics Research", Dresden, Germany, May 2003
- 229) University of Regensburg, Distinguished Lecturer (2 lectures)" Role of Solid State Chemistry in Thermoelectrics Research" and "New Synthesis Approaches in Solid State Inorganic Chemistry", Germany May 2003
- 230) "Physics of Advanced Materials" Summer School, Thessaloniki Greece, July 2003
- 231) 39th IUPAC Congress 86th Conference of The Canadian Society
- 232) Gordon Research Conference, Lecture on Solid State Chemistry-II, Oxford, UK, September 2003
- 233) Hilldale College, "Advances in Solid State Chalcogenide Chemistry", Hillsdale MI
- 234) Materials Research Society, Symposium on Thermoelectric Materials, Boston, MA, December 2003
- 235) DARPA Workshop on Thermoelectric Power Generation, Las Vegas, December, 2003
- 236) Du Pont Company, "Thermoelectric Materials for Power Generation", Delaware, April 2004
- 237) Molecular Electronics and Electronic Materials Symposium (6/2-3/04), IUPUI, American Chemical Society Meeting, Indianapolis, IN, June 2004
- 238) ACA 20th "Materials for the 21st Century", Chicago, IL, July 2004
- 239) International Workshop in Intermetallics, Sigtuna Sweden, September 2004
- 240) Washington University, Colloquium, Saint Louis, MO, October 2004
- 241) Materials Research Society Meeting, Symposium on Inorganic Solid State Materials, December 2004
- 242) DARPA Workshop on Thermoelectric Power Generation, San Diego, CA, December 2004
- 243) Oberlin College, "Energy from Waste Heat and Solid State Chemistry: The Search for New Thermoelectric Materials", Oberlin, OH, February 2005
- 244) Harvard University, Colloquium, Department of Applied Physics, Cambridge, MA, March 2005
- 245) Northwestern University, Colloquium, Department of Chemistry, Evanston, IL, April 2005
- 246) United Technologies Research Center, Distinguished Lecture, Hartford, CT, April 2005
- 247) University of Notre Dame, Midwest Solid-State Chemistry Conference 2005, The Metal Flux – A Preparative Tool for the Exploration of Intermetallic Compounds, Notre Dame, IN, May 2005
- 248) 8th FIGIPAS Meeting in Inorganic Chemistry, Recent Advances in Thermoelectric Materials, Athens, Greece, July 2005
- 249) 15th International Symposium, Boron, Borides and Related Compounds, Plenary Lecture, Hamburg, Germany, August 2005

- 250) Materials Research Society Conference, Symposium on Thermoelectric Materials, Invited Speaker, Boston, MA, December 2005
- 251) Arizona State University, Colloquium, Department of Chemistry, AZ, February 2006
- 252) 2006 ACS National Meeting, Symposium on Phase Change Materials, San Francisco, CA
- 253) American Physical Society, Invited Speaker for Session on Emerging Energy Materials, Baltimore, MD, March 2006
- 254) Texas A&M University, Colloquium, Department of Chemistry, College Station, TX, April 2006
- 255) Purdue University, Colloquium, Department of Chemistry, Richmond, IN, April 2006
- 256) Conference on Nanomaterials for Defense Applications, Invited Speaker, Virginia Beach, VA, May 2006
- 257) Energy Nanotechnology International Conference, Keynote Speaker, MIT, Cambridge, MA, June 2006
- 258) Direct Energy Conversion Workshop, Coronado, CA, August 2006
- 259) Air Force Research Laboratory, Colloquium, Dayton, OH, September 2006
- 260) Pittsburgh Diffraction Conference, Invited Speaker Pittsburgh, PA, October, 2006
- 261) MRS Meeting Symposium on Solar Energy Conversion, "Nanostructured LAST and PbTe-based Thermoelectrics for Power Generation", J. R. Sootsman, P. F. P. Poudeu, M. K. Han, H.J. Kong, C. Uher, A. Downey, J. J. D'Angelo, C.-I Wu, T. P. Hogan, R. Fen, E. Case, E. Timm, H. Schock, and M. G. Kanatzidis, Boston, MA, December 2006
- 262) Air Force Research Laboratory Workshop on Reconfigurable Materials, Albuquerque, NM, February 2007
- 263) Naval Research Laboratory, "What to Expect from Exploratory Synthesis: from Chalcogenides to Intermetallics to Thermoelectrics", Washington, DC, February 2007
- 264) Materials Science Division, "What to Expect from Exploratory Synthesis: from Chalcogenides to Intermetallics to Thermoelectrics", Argonne National Laboratory, Argonne, IL, April 2007
- 265) DARPA/MTO Components from Thermoelectric Materials Workshop "Recent Progress in Advanced Thermoelectric Materials", Washington, DC, May 2007
- 266) Canadian Chemical Society Meeting, Symposium on Energy Conversion, "Nanostructured Thermoelectrics for Thermal to Electrical Energy Conversion", Winnipeg, Canada, May 2007
- 267) "Stable Nanostructured Thermoelectrics", J. Sootsman, F. Poudeu, C.-I Wu, H.-J. Kong, C. Uher, T. Hogan, D. Y. Chung, and M. G. Kanatzidis, Electronic Materials Conference, Notre Dame, IN, June 2007
- 268) International Symposium on Intercalation Compounds, Plenary Lecture on "The Quest for Porous Semiconductors", Seoul, S. Korea, June 2007
- 269) University of Crete, The Quest for Porous Semiconductors, Department of Chemistry, July 2007
- 270) Direct Energy Conversion Workshop, Vail, CO, August 2007
- 271) Energy from Waste Heat: Solid State Chemistry and Thermoelectrics, Keynote Lecture, German Chemical Society Meeting, Ulm, Germany, September 2007
- 272) University of Marburg, Colloquium Speaker, Marburg, Germany, September 2007
- 273) University of Giessen, Giessen, Colloquium Speaker, Germany, September 2007
- 274) Argonne National Laboratory, Chemistry Division Seminar October 2007
- 275) Argonne National Laboratory, "The Promise of Exploratory Synthesis" Regional Opportunities in Materials Synthesis, October 2007
- 276) "Energy from Waste Heat" Dow Corning, Midland, MI, October 2007
- 277) MRS Meeting, Boston, MA, November 2007
- 278) "High Performance Nanostructured LAST Materials", Thermoelectric Materials Symposium, December 2007
- 279) University of Chicago, "Energy from Waste Heat", Department of Chemistry, Chicago, IL, January 2008
- 280) UCSB-MPG Workshop on Inorganic Materials for Energy Conversion, Storage, and Conservation, UCLA Lake Arrowhead Conference Center, Lake Arrowhead, CA, February 2008

- 281) University of Northern Iowa, Sigma Xi Lecturer, "What to Expect from Exploratory Synthesis" and "Nanostructured Thermoelectrics for Power Generation", February 2008
- 282) University of California Berkeley, "Nanostructured Thermoelectrics for Power Generation", February 2008
- 283) Zing Solid State Chemistry Conference, Plenary Lecture, Cancun, Mexico, March 2008
- 284) Spring MRS Symposium KK, Energy Harvesting--From Fundamentals to Devices, March 2008
- 285) ACS National Meeting, "Growing Nanocrystals Inside Crystals", Symposium on Nanomaterials New Orleans, LA, April 2008
- 286) ACS National Meeting, ACS Award for Distinguished Service in the Advancement of Inorganic Chemistry in Honor of Tobin J. Marks, "Porous Semiconductors", New Orleans, LA, April 2008
- 287) Northwestern University, "What to Expect from Exploratory Synthesis," Colloquium, Department of Materials Science and Engineering, April 2008
- 288) University of Delaware, "The Metallic Flux as a Synthesis Tool for Intermetallics", Colloquium, Department of Chemistry, April 2008
- 289) Arizona State University, "Quaternary Nanocrystals of the Thermoelectric Materials AgPbmSbTem+2: Phase-Segregated or Solid Solutions? Pair Distribution Function in Complex Materials Workshop, Tempe, AZ, May 2008
- 290) Nanoporous Materials V, "The Quest for Porous Semiconductors", Plenary Lecture, Vancouver, British Columbia, May 2008
- 291) International Symposium on Structure-Property Relationships in Solid State Materials, "Energy from Waste Heat: Bulk Thermoelectric Nanostructures", Nantes, France, June 2008
- 292) Northwestern University, NSF Summer Institute on Nanomechanics, Nanomaterials and Micro/Nanomanufacturing, Lectures on Challenge and Nanotechnology, Evanston, IL, June 2008
- 293) International Conference on Thermoelectrics, "Nanostructured Lead Chalcogenides for Efficient Thermoelectric Power Generation Applications", Corvallis, OR, August 2008
- 294) University of Illinois, Colloquium, Urbana Champaign, IL, October 2008
- 295) University of Aarhus, Denmark, Colloquium, November 2008
- 296) MRS Meeting, Boston, MA, December 2008
- 297) Direct Thermal-to-Electric Energy Conversion Program Review and Workshop, Monterrey, CA, December 2008
- 298) University of Munich, Germany, February 2009
- 299) AMS Winterschool, Alps, Austria, February 2009
- 300) Northwestern University, Colloquium, Environmental Engineering Department, Evanston, IL, February 2009
- 301) University of Pittsburgh, "The Quest for Porous Semiconductors", Colloquium, Pittsburgh, April 2009
- 302) Materials Research Society Meeting, San Francisco, CA, April 2009
- 303) Initiative for Sustainability and Energy at Northwestern University, Argonne National Laboratory, Argonne, IL, April 2009
- 304) North American Solid State Chemistry Conference, Ohio State University, June 2009
- 305) Gordon Research Conference, "The Quest for Porous Semiconductors", Biddeford, ME, June 2009
- 306) 42nd IUPAC Congress Chemistry Solutions, "From Heat to Electricity: Bulk Thermoelectric Nanostructures", Glasgow, UK, August 2009
- 307) 17th American Conference on Crystal Growth and Epitaxy, Lake Geneva, WI, August 2009
- 308) American Chemical Society Meeting "Materials Discovery in Intermetallics Using Liquid Metals as Solvents", Washington, DC, August 2009
- 309) DTRA-Basic Research Technical Review "Novel Semiconductor Chalcogenide Materials for Gamma Ray Detection", Springfield, VA, October 2009
- 310) Direct Thermal-to-Electrical Energy Conversion (DTEC), Washington, DC, November 2009
- 311) University of Wisconsin, Madison, WI, November 2009

- 312) UOP R&D, Invited Speaker, Des Plaines, IL, December 2009
- 313) National Institute of Standards and Technology (NIST), Plenary Speaker on “Power from Waste Heat with Nanostructured Thermoelectrics”, Gaithersburg, MD, December 2009
- 314) Northwestern University, “Thermal to Electrical Energy Conversion with Nanostructure Semiconductors: Phonon Blocking Electron Transmitting Materials”, Distinguished Speaker Series, Electrical Engineering & Computer Science Department, Evanston, IL, January, 2010
- 315) Stanford University, Colloquium Talk, February, 2010
- 316) Materials Research Society Meeting, San Francisco, CA, April 2010
- 317) 3rd Annual Academic Research Initiative (ARI) Grantees Conference, Alexandria, VA, April 2010
- 318) National Synchrotron Light Source User’s Meeting, “Understanding and Controlling Nanoscale Fluctuations in Thermoelectric Materials”, Brookhaven National Laboratory, Upton, NY, May 2010
- 319) Weizmann Institute, Israel, June 2010
- 320) Gordon Research Conference, New London, NH, August 2010
- 321) DTRA Basic Research Tech Review, Springfield, VA, August 2010
- 322) Renewable Sciences & Tech Workshop, Plenary talk, Harvard, Cambridge, MA, October 2010
- 323) Materials Research Society Meeting, Boston, MA, November 2010
- 324) Notre Dame University, Colloquium Talk, South Bend, IN, February 2011
- 325) Massachusetts Institute of Technology, Colloquium Talk, Boston, MA, March 2011
- 326) NSF Materials Design and Synthesis Workshop, UCSB, Santa Barbara, CA, March 2011
- 327) ACS National Meeting, Symposium talk, Anaheim CA, March 2011
- 328) MRS Meeting, Symposium talk, San Francisco CA, April 2011
- 329) Talks at Department of Homeland Security Workshop, Washington DC, April 2011
- 330) Talk at EFRC Summit, DOE BES event, Washington DC, May 2011
- 331) University of Crete, Plenary Talk at Porous Materials Meeting, Heraklion Crete, Greece, June 2011
- 332) University of Cyprus, Colloquium Talk, Nicosia, Cyprus, July 2011
- 333) Plenary Lecture, Talk at Nanotechnology Conference, Thessaloniki, Greece, July 2011
- 334) Plenary Lecture, Talk at International Conference on Thermoelectrics, Traverse City MI, July 2011
- 335) Talk at DTRA Basic Research Tech Review, Springfield, VA, July 2011
- 336) Plenary Lecture, Japanese Thermoelectric Society Conference, Sapporo, Japan, August 2011
- 337) AIST, Colloquium Talk, Tsukuba, Japan, August 2011
- 338) Plenary Lecture, European Thermoelectric Society Conference, Plenary Talk, Thessaloniki, Greece, September 2011
- 339) Plenary Talk at International Symposium on Clusters and Nano-Structures, Richmond, VA, November 2011
- 340) Talk at University of Essen, Duisburg, Germany, December 2011
- 341) Florida State University, Colloquium Talk, January 2012
- 342) Talk at University of Wisconsin, January 2012
- 343) Talk at American Physics Society, Boston, February 2012
- 344) Talk at Indiana University, Bloomington, IN, February 2012
- 345) Princeton University, Colloquium Talk, March 2012
- 346) Indiana University, Colloquium Talk, March 2012
- 347) Harvard University, Colloquium Talk, March 2012
- 348) ACS National Meeting, Symposium Talk, March 2012
- 349) Plenary Lecture, 18th International Conference on Solid Compounds of Transition Elements, Lisbon, Portugal, April 2012
- 350) Plenary Lecture at European MRS, Strasbourg, France, May 2012

- 351) Plenary Lecture at International Thermoelectric Society Conference, Aalborg, Denmark, July 2012
- 352) Gordon Research Conference, Talk on “Solid State Chemistry”, New London, NH, July 2012
- 353) International Society for Optics and Photonics (SPIE), San Diego, CA, August 2012
- 354) Plenary Lecture, High Temperature Materials Chemistry Conference, China, September 2012
- 355) Plenary Lecture, Solar Energy Conference, Taipei Taiwan, October 2012
- 356) Materials Research Society, Boston, MA, November 2012
- 357) Materials Research Society Outreach Program Symposium, Santa Barbara, CA, February 2013
- 358) National University of Singapore, 2013
- 359) Materials Research Society, San Francisco, CA, April 2013
- 360) Plenary Lecture, 5th International Conference on Hybrid and Organic Photovoltaics, Seville, Spain, May 2013
- 361) Plenary Lecture, Materials and Renewable Energy 2013, Athens, Greece, July, 2013
- 362) Colloquium Talk, University of Iowa, Iowa City, IA, August 2013
- 363) Colloquium Talk, Purdue University, Lafayette, IN, September 2013
- 364) Plenary Lecture, Brazilian Materials Research Society, September 2013
- 365) Plenary Lecture, “Directions in Materials Sciences” conference and Cambridge-JNCASR Winter School, Bangalore, India, 2013
- 366) Colloquium Talk, University of Michigan, Department of Materials Science and Engineering, December 2013
- 367) Colloquium Seminar, University of Southern California, Department of Chemistry, January 2014
- 368) Colloquium Seminar, Johns Hopkins University, Department of Chemistry, February 2014
- 369) Colloquium Seminar, UCLA, Department of Chemistry, February 2014
- 370) University of California Davis, Department of Chemistry, February 2014
- 371) University of California Berkeley, Department of Chemistry, February 2014
- 372) University of California Santa Barbara, Department of Materials, April 2014
- 373) 6th Hybrid Organic Photovoltaic Conference, Lausanne, Switzerland, May 2014
- 374) Weapons & Material Security (WMS) Team Program Review Meeting, Argonne National Laboratory, Argonne, IL, May 2014
- 375) University of California Santa Barbara, Department of Chemistry, June 2014
- 376) DND OARI Program Review Meeting, Leesburg, VA, June 2014
- 377) Plenary Lecture, International Thermoelectric Society Meeting, Nashville, TN, July 2014
- 378) Gordon Research Conference in Solid State Chemistry, New London, NH, July 2014
- 379) Plenary Lecture, Flatlands Beyond Graphene (FBG), Dublin, Ireland 2014
- 380) Amercian Chemical Society Meeting, San Francisco, August 2014
- 381) International Symposium on Advanced Nanoporous and Nanostructured Materials, “Chalcogels: chalcogenide aerogels for gas separation and catalysis” Heraklion, Greece, September 2014
- 382) Plenary Lecture, International Conference Solution processed Semiconductor Solar Cells, Oxford, United Kingdom, September 2014
- 383) Plenary Lecture, Nanoscience and Nanotechnology Conference, Tel Aviv, Israel October 2014.
- 384) Colloquium Talk, Chicago Regional Inorganic Colloquium, Evanston, IL, November 2014
- 385) 21st Symposium (IEEE) on Room-Temperature Semiconductor X-ray and Gamma-ray Detectors, Seattle, WA, November 2014
- 386) Department Colloquium, Chemistry, Stanford University, November, 2014
- 387) Materials Research Society Meeting, Boston, December 2014 (MRS Medal Award Lecture)
- 388) Invited talk, Chalcogel sorbents for effective capture and consolidation of radioiodine. Symposium EE: Scientific Basis for Nuclear Waste Management, 2014 MRS Fall Meeting, Boston, MA. November 2014
- 389) Colloquium Seminar, University of Texas Austin, February 2015
- 390) Gordon Research Conference in Nanomaterials for Energy Applications, Ventura, CA, February 2015

- 391) Michigan State University, Science at the Edge Seminar, March 2015
- 392) Colloquium Seminar, Columbia University, March 2015
- 393) ACS National Meeting and Exposition; Denver, Colorado, March 2015
- 394) Colloquium Seminar, Columbia University, New York, April 2015
- 395) Group Poster presenters; MRS Spring Meeting and Exhibit, San Francisco, April 2015
- 396) ANSER Solar Electricity Perovskite Solar Cells 8th Annual Solar Energy Symposium, Evanston, IL, April 2015
- 397) HOPV15 meeting, Rome, Italy, May 2015
- 398) Invited Talk, NASSCC 2015, Florida State University, Florida, May 2015
- 399) Invited Talk, Chinese Thermoelectric Society Conference, Hangzhou, China, May 2015
- 400) Invitation for Plenary Talk in Nanotechnology, University of Ioannina, Greece, June 2015
- 401) Invitation for Plenary Talk in Nanotechnology, Aristotle University of Thessaloniki, Greece, July 2015
- 402) Invited Talk, Philadelphia Theory of Energy Conversion, Penn Conference in Theoretical Chemistry, University of Pennsylvania, July 2015
- 403) Presenter and Organizer, ACS Boston Convention and Exposition Center; (1) Solar Energy, Inorganic-Organic hybrid tin and lead based perovskites: From chemistry to solar cells (2 & 3) Materials for Heat to Energy Conversion, Boston, MA, August 2015
- 404) Invited talk, Conference on Perovskite Solar Cells and Optoelectronics, Lausanne, Switzerland, September 2015
- 405) Award Recipient, President of Italy awarded ENI Award Renewable Energy Prize, Rome, Italy, October 2015
- 406) Attended, ANSER Midterm Review, Washington DC, January 2016
- 407) Award Recipient, 2015 Wilhelm Manchot Research Professorship, Technical University of Munich. Munich, Germany, January 2016
- 408) Invited talk, Northern Illinois University Colloquium, DeKalb, IL, February 2016
- 409) Attended, DOE Basic Needs Quantum Materials Workshop, Washington, D.C., February 2016
- 410) Award Recipient, American Chemical Society Award in Inorganic Chemistry, San Diego, March 2016
- 411) Seminar, Columbia University, New York, NY, March 2016
- 412) Award Recipient, American Physical Society, 2016 James C. McGroddy Prize for New Materials, Baltimore, March 2016
- 413) Invited talk, "Inorganic-Organic Halide Perovskites: Inorganic Chemistry, Solar Cells", MRS Meeting, Phoenix, AZ, March 28 – April 1, 2016
- 414) Seminar, University of Florida, Gainesville, FL, April 2016
- 415) Invited talk, Perovskite Solar Cells, "Frontiers Lecture" in Los Alamos National Laboratory, Albuquerque, NM, April 2016
- 416) Invited talk, "New inorganic solids from synthesis in molten chalcogenide salts: Structural diversity to applications", "Frontiers Lecture" Pacific Northwest National Laboratory, April 2016
- 417) Attended, Lawrence National Laboratory: Review of "Advanced Materials for Detectors Venture", Berkeley, CA May 2016
- 418) Invited talk, "Nanostructured and Single Phase Thermoelectrics" ICT2016 Wuhan, China, June 2016
- 419) Invited Talk, 2016 University & Industry Technical Interchange (UITI), Raleigh, North Carolina, June 2016
- 420) Invited talk, Gordon Conference on Hybrid Electronic & Photonic Materials and Phenomena, Hong Kong, June 2016
- 421) Invited talk, Gordon Conference in Solid State Chemistry, New London, NH, July 2016
- 422) Invited talk, Symposium on Functional Materials in Beijing Normal University, September 2016
- 423) Plenary Lecture, 2nd International Conference on Perovskite Solar Cells and Optoelectronics, 2016 PSCO Meeting, Genoa, Italy, September 2016

- 424) Invited talk, PRiME 2016/230th ECS Meeting, Honolulu, HI, October 2016
- 425) Invited talk, “Thermoelectric materials from single phases to nanostructures with my collaborators Citrad Uher”, Citrad Uher Symposium, Ann Arbor, MI, October 2016
- 426) Invited talk, DOE-BES Workshop on NH₃ Synthesis, Washington, DC, October 2016
- 427) Award Recipient, 2016 Samson Prime Minister’s Prize for Innovation in Alternative Fuels for Transportation: Fuel Choices Summit, Habima Theater, Tel-Aviv, Israel, November 2016
- 428) Invited talk, “Chemistry and Solar Cells of Inorganic-Organic Halide Perovskites”, 2016 MRS Meeting, Boston, MA, November 2016
- 429) DARPA Thermoelectric Annual Review, Raleigh, NC, December 2016
- 430) Award Recipient, American Chemical Society/Aldrich Award Lecture, “Inorganic Solids from Synthesis in Molten Chalcogenide Salts: from Structural Diversity to Applications”, Northwestern University, Evanston, IL, December 2016
- 431) Seminar, University of Bath, Bath, United Kingdom, February 2017
- 432) Seminar, University of Liverpool, Liverpool, United Kingdom, February 2017
- 433) Seminar, Strathclyde University, Glasgow, United Kingdom, February 2017
- 434) Seminar, University of Crete, Crete, Greece, March 2017
- 435) Attended, 253rd ACS National Meeting and Exposition, San Francisco, CA, April 2017
- 436) Attended, NSARD Program Review, Las Vegas, NV, April 2017
- 437) Award Recipient, Hershel and Hilda Rich Visiting Professorship Award Lectures, “Energy from Waste Heat: How Thermoelectric Materials are Designed and Used”, “Halide Perovskites: New High Performance Semiconductors”, and “Inorganic Chalcogenide Solids: From Discovery to Design and Applications”, Technion – Israel Institute of Technology, Haifa, Israel, April 2017
- 438) Invited talk, George H. Cady Endowed Lecture in Inorganic Chemistry: “Halide Perovskites: New High Performance Semiconductors”, University of Washington, Seattle, WA, May 2017
- 439) Invited talk, “Inorganic Chalcogenide Solids: From Discovery to Design and Applications”, Inorganic Chemistry Seminar, University of Washington, Seattle, WA, May 2017
- 440) Invited talk, “The Renaissance of Halide Perovskites: Poor Man’s Semiconductors”, Clean Energy Institute Seminar, University of Washington, Seattle, WA, May 2017
- 441) Invited talk, “Rational and Irrational Synthesis of New Materials: Discovery, Design, and Predication”, APS Physics Next Workshop, Long Island, NY, May 2017
- 442) Invited talk, “Design of Stable Solar Cells with >15% Efficiency Based on 2D Perovskites”, ONR Organic and Hybrid Perovskite Photovoltaics Program Review, Baltimore, MD, May 2017
- 443) Plenary Lecture, 13th International Conference on Materials Chemistry (MC13), “Rational Design of High Performance Thermoelectrics”, Liverpool, United Kingdom, July 2017
- 444) Invited talk, 2017 DOE EFRC-Hub-CMS-PI Meeting, “Lead-free Perovskite Films for Heterojunction Depleted Perovskite Solar Cells”, Washington D.C., July 2017
- 445) Plenary Lecture, 21st American Conference on Crystal Growth and Epitaxy (ACCGE-21) and 18th US Workshop on Organometallic Vapor Phase Epitaxy (OMVPE-18), “New Hard Radiation Detection Semiconductor Materials”, Santa Fe, NM, August 2017
- 446) Invited talk, National Academies (NASEM) Decadal Survey on Materials Research, “Materials Designed for Low Energy Growth”, Chicago, IL, September 2017
- 447) Plenary Lecture, International Workshop on Piezoelectric Materials and Applications (IWPMA) 12th Energy Harvesting Workshop (EHW) 1st Annual Energy Harvesting Society Meeting (AEHSM), “Energy From Waste Heat: How Thermoelectric Materials are Designed and Used”, Falls Church, VA, September 2017
- 448) Invited talk, 2017 E-MRS Fall Meeting, “Halide Perovskites: New High Performance Semiconductors”, Warsaw, Poland, September 2017
- 449) Invited talk, 7th Bonn Humboldt Award Winners’ Forum: Fundamental Concepts and Principles of Chemical Energy Conversion, “Halide Perovskites: Poor man’s new high performance semiconductors”, Bonn, Germany, October 2017

- 450) Invited talk, Chemistry Colloquium – Department of Chemistry, University of Chicago, “3D and 2D Halide Perovskites: Poor Man’s High Performance Semiconductors”, Chicago, IL, November 2017
 - 451) Invited talk, 2017 MRS Fall Meeting: ES01: Perovskite Materials and Devices—Progress and Challenges, “Halide Perovskites: New High Performance Semiconductors”, Boston, MA, December 2017
 - 452) Invited talk, 2018 MRS Spring Meeting: EN15: Novel Materials Physics of Perovskite Semiconductors, “ Chemistry and Devices of Halide Perovskites Semiconductors” and “3D and 2D Halide Perovskites: Poor man’s high performance semiconductors”, Phoenix, AZ, April 2018
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