

## Biographical Sketch

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### Professor Tao Xu

Department of Chemistry and Biochemistry, Northern Illinois University, DeKalb, IL 60115

Tel: (815)753-6357; Fax: (815) 753-4802; E-mail: [txu@niu.edu](mailto:txu@niu.edu);

[Xu Group Page](#)

[Xu Google Scholar Site](#)

### Professional Preparation

Bachelor Degree, East China University of Science and Technology, Shanghai, China	1995
Ph.D. Department of Chemistry, The University of Alabama, Tuscaloosa, AL, USA	2003
Post-doc, Department of Chemistry, Texas A&M University, USA	2003-2004
Post-doc, Materials Science Division, Argonne National Laboratory, USA	2004-2006

### Appointments

August 2017-Present: Professor, Department of Chemistry & Biochemistry, Northern Illinois University, DeKalb, Illinois, USA

August 2012-2017: Associate Professor, Department of Chemistry & Biochemistry, Northern Illinois University, DeKalb, Illinois, USA

August 2006-August 2012: Assistant Professor, Department of Chemistry & Biochemistry, Northern Illinois University, DeKalb, Illinois, USA

### Research Synopsis

Xu's research has been centered on fundamental study of electron-driven and photon-driven charge and mass transport at interfaces in energy systems. Through cohesive effort in design, synthesis, characterization, application and theory/modeling of novel materials, nanoscale structures and assemblies, Xu group has been continuously making scientific and technological breakthroughs in energy and environmental fields ranging from solar energy conversion and utilization, electrical energy storage, chemical and electrochemical catalysis for carbon dioxide conversion, and gas sensors. Xu's recent effort is in the forefront of hybrid perovskite materials exemplified by his pioneering work in mitigating the toxicity of perovskite solar cells, innovation of pseudohalides based perovskite materials, discovery of abnormal properties of perovskite materials under high-pressure and so on. Xu is also spearheading electrocatalytic CO<sub>2</sub> conversion using a unique single-atom based process that can convert CO<sub>2</sub> to ethanol with over 90% current efficiency and record-low driving potential. Xu's frontier work has received extensive attention globally as evidenced by numerous reports on his work by news media and federal agencies ([NSF](#), [Scientific American](#), [ScienceDaily](#), [PV Magazine](#), [NREL](#), [Argonne News](#), [Advanced Photon Source](#), [University of Chicago](#), [Popular Mechanics](#), [Earth.com](#), [News Break](#) and many others). Xu has published nearly 100 peer-reviewed papers and many of them are on prestigious top journals such as *Nature*, *Nature Energy*, *Proceedings of National Academy of Science*, *Nature Sustainability*, *Journal of American Chemical Society*, *Advanced Materials*, and *Angewandte Chemie* etc. Xu has so far been awarded for ~\$3.8M extramural grants from National Science Foundation, Department of Energy, Argonne National Laboratory, American Chemical Society and industry partners. Xu has 17 patents and inventions and four of them are licensed.

## **Awards and Honors**

1. R&D 100 Award for “Ultrafast and ultrasensitive hydrogen sensors based on self-assembly monolayer promoted 2-dimensional palladium nanoclusters”, October, **2006**
2. R&D Magazine Micro/Nano 25 Award, **2006**
3. NIU Outstanding Mentor Award, **2010**
4. [National Science Foundation CAREER Award](#), **2012**
5. Honored International Chair Professorship, Taipei University of Technology **2015**
6. Northern Illinois University Excellence in Innovation Award recipient, **2016**
7. Best Presentation Award in Energy and Fuel Session, 252<sup>nd</sup> American Chemical Society National Meeting in Philadelphia, PA August **2016**
8. NIU Presidential Research Professorship starting from July, **2019**
9. [R&D 100 Award for “Versatile Method for Preparing Highly Effective Electro-catalyst for CO<sub>2</sub> to Chemical Conversion”](#), Sept, **2020**
10. Highlighted as [Researchers to Know 2020 by Illinois Science and Technology Coalition](#), **2020**.
11. [National Science Foundation Special Creativity Award](#), **2022**
12. Highlighted as [Innovator to Know 2023](#) by Illinois Innovation Network, **2023**.

## **Memberships**

Member of American Chemical Society, Member of Materials Research Society

## **PhD graduates under my advisory and post-graduate career paths**

- Chi-kai Lin, Ph.D. (2007–2011), Post-doc at Argonne National Laboratory, he is now a Advanced Material Scientist at Apple Inc. (A Fortune #1 company)
- Zhenzhen Yang, Ph.D. (2007–2011), Post-doc at Argonne National Laboratory, now an Assistant Chemist at Chemical Sciences and Engineering, Argonne National Laboratory.
- Xiaoqiao Zeng, Ph.D. (2008–2012, co-advised by Zhili Xiao), Post-doc at Argonne National Laboratory, then a term Chemist at Chemical Science and Engineering Division of Argonne National Laboratory.
- Lauren Grabstanowicz, Ph.D. (2010–2014), Research Scientist and now a project manager at Alcoa Inc. (A Fortune 125 company).
- Heather Barkholtz, Ph.D. (2012–2016), Post-doc at Sandia National Laboratory, worked as a Chemical Test Section Chief at the Wisconsin Department of Transportation, and now an assistant professor at University of Wisconsin Madison with a joint appointment between the Wisconsin State Laboratory of Hygiene and the UW's School of Pharmacy.
- Qinglong Jiang, Ph.D. (2012–2015), Post-doc at National Magnetic Field Laboratory and Florida State University, now an Assistant Professor at Department of Chemistry and Physics, University of Arkansas at Pine Bluff.
- Jue Gong, Ph.D. (2014-2018), post-doc at Brown University, now an Associate Professor at University of Electronic Technology, China.
- Dominic Rebolla, Ph.D (2014-2019), current under physical recovery

- Dean Walters, Ph.D in 2019, now a senior Engineer at Argonne National Laboratory
- Haiping Xu, Ph.D. (2015-2020), now a postdoc at Argonne National Laboratory in Apple Project.
- Crysetal Ferels, Ph.D. (2016-2020, co-advised with Chong Zheng), now a postdoc at Argonne National Laboratory.
- Erik Sarnello, Ph.D. (2017-2021, co-advised with Tao Li), now a postdoc at Argonne National Laboratory.
- Xun Li, Ph.D. (2018-2022), now a Research Scientist at Applied Materials Inc, (A Fortune 156 company), Santa Clara, California.

**Publications on Peer-Reviewed Journals (H-index=44, i10 index=81, total citation>7800)**

[Xu Google Scholar Site](#)

98. Li, M. Park, S. Y.; Wang, J.; Zheng, D.; Wostoupal, O. S.; Xiao, X.; Yang, Z.; Li, X.; Diroll, B. T.; Marks, T. J.; Zhu, K.; Xu, T. [Nickel-Doped Graphite and Fusible Alloy Bilayer Back Electrode for Vacuum-Free Perovskite Solar Cells](#). *ACS Energy Letters*, **2023**, 8, 2940-2945.
97. Tong, J.; Li, X.; Wang, J.; He, H.; **Xu, T.**; Zhu, K. [Bioinspired stability enhancement in deuterium-substituted organic–inorganic hybrid perovskite solar cells](#), *PNAS Nexus*, **2023**, 2(5), pgad160.
96. Olusola John Dahunsi, O. J.; Li, B.; Gao, S.; Lu, K.; Xia, F.; Xu, T.; Cheng, Y. One-Step Synthesis of Na–Sn Alloy with Internal 3D Na<sub>15</sub>Sn<sub>4</sub> Support for Fast and Stable Na Metal Batteries, *ACS Appl. Energy Mater.* **2022**, 5, 20–26.
95. Li, X.; Zhang, F.; Wang, J.; Tong, J.; Xu, T.; Zhu, K.; [On-device lead-absorbing tapes for sustainable perovskite solar cells](#), *Nature Sustainability*, **2021**, 4, 1038–1041. Highlighted by [NIU](#), [NREL](#), [PV-Magazine](#), [World Industrial Reporter](#), [Perovskite Info.](#), [Solar Press](#)
94. Gao, S.; Li, B.; Lu, K.; Alabidun, S.; Xia, F.; Nickel, C.; Xu, T.; Cheng, Y.; [Modulating MnO<sub>2</sub> Interface with Flexible and Self-Adhering Alkylphosphonic Layers for High-Performance Zn-MnO<sub>2</sub> Batteries](#), *ACS Appl. Mater. Interfaces* **2021**, 13, 23724–23731.
93. Gong, J.; Li, X.; Guo, P.; Marks, T. J.; Schaller, R. D.; Xu, T.; Suppressed Oxidation and Photodarkening of Hybrid Tin Iodide Perovskite Achieved with Reductive Organic Small Molecule, *ACS Appl. Energy Mater.* **2021**, 4, 4704–4710.
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91. Duvvuru (a1), M. K.; Wu, L.; Lin, N. S.; Xu, T.; Vahabzadeh S.; Surface treatment of titanium by anodization and iron deposition: mechanical and biological properties, *J. Mater. Res.* **2020**, *35*, 1290-1297.
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89. Lu, K.; Xu, H.; He, H.; Gao, S.; Li, X.; Zheng, C. Xu, T.; Cheng, Y.; Modulating reactivity and stability of metallic lithium via atomic doping, *J. Mater. Chem. A*, **2020**, *8*, 10363-10369.
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87. Perugupalli, D. H.; Xu, T.; Cho, K. T. Activation of Carbon Porous Paper for Alkaline Alcoholic Fuel Cells, *Energies* **2019**, *12*, 3207.
86. Li, X.; Zhang, F.; He, H.; Berry, J. J.; Zhu, K.; Xu, T. [On-device lead sequestration for perovskite solar cells](#), *Nature*, **2020**, *578*, 555–558. Highlighted by [NSF](#), [Scientific American](#), [ScienceDaily](#), [Yahoo Finance](#), [PV Magazine](#) and our collaborators at [NREL](#).
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The following papers are published before joining in NIU

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3. Tian, H.; Xu, T.; Zhao, Y.; Chen, K. "Two-Path Photo-Induced Electron Transfer in Naphthalimide-Based Model Compound", *J. Chem. Soc., Perkin Trans.* **1999**, *2 (3)*, 545-549.
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1. Su, J.; Xu, T.; Chen, K.; Tian, H. "Electroluminescence properties of twisted dyad 1,8-naphthalic anhydride derivatives", *Syn. Metals*, **1997**, *91*, 249-251.

### Book Chapters

3. Jue Gong and Tao Xu: Chapter 4. Perovskite Materials in Biomedical Applications, <https://www.springer.com/gp/book/9789811512667#aboutBook>  
In the book of Revolution of Perovskite Synthesis, Properties and Applications Editors: Arul, Narayanasamy Sabari, Nithya, V.D. (Eds.)  
<https://www.springer.com/gp/book/9789811512667#aboutBook>
2. Guilian Zhu, Tao Xu, Fuqiang Huang, "[The Black and White Issue of Nanotitania](#)" Chapter 5, page 77-117, Feb. 2017, in the book of "Black TiO<sub>2</sub> Nanomaterials for Energy Applications" Edited by: Xiaobo Chen (University of Missouri-Kansas City, USA), Yi Cui (Stanford), World Scientific Publishing Co Pte Ltd, ISBN: 978-1-78634-165-5.
1. Tao Xu, "[Nanoarchitected Electrodes for Enhanced Electron Transport in Dye-Sensitized Solar Cells](#)", Chapter 7, page 271-298, "Energy Efficiency and Renewable Energy through Nanotechnology", Ed. Z. Ling, Springer. ISBN: 978-0-85729-637-5.

## Patents and Inventions

1. Xu, T.; Zach, M.P.; Xiao, Z. L. “Ultrafast and ultrasensitive hydrogen sensors based on self-assembly monolayer promoted 2-dimensional palladium nanoclusters” U.S Patent 7171841 issued on Feb. 6, 2007. Licensed to Makel Engineering, Inc. (Chico, CA).
2. Xu, T. “Highly Efficient Dye Sensitized Solar Cells using micro-textured electron collecting anode” U.S. Patent 9,129,751 B2, issued on September 8, 2015. owned by Northern Illinois University.
3. Xu, T. Electrochromic Device Having Three-Dimensional Electrode, Patent publication # US 2015/0055206 A1. owned by Northern Illinois University.
4. Xu, T. Perovskite Photovoltaic Device, Patent NO.: US10,586,659 B2, Date of Patent: Mar. 10, 2020, owned by Northern Illinois University.
5. Xu, T. Perovskite Photovoltaic Device, Patent NO.: US11,232,914 B2, Date of Patent: Jan. 25, 2022, owned by Northern Illinois University.
6. Xu, T. Doped Perovskite having improved stability, and solar cells made thereof, Patent NO.: US 10,388,898 B2, Date of Patent: Aug. 20, 2019, owned by Northern Illinois University.
7. “Highly efficient and durable on-device metal sequestering tapes for solar cells and modules”, PCT Application No.: PCT/US22/73991, Inventors: Kai Zhu and Tao Xu, Owner, NREL and NIU, Filed: July 21, 2022.
8. International PCT patent (series No. PCT/US2020/012712) titled “Sequestering compositions and materials cross-reference to related applications” was submitted via National Renewable Energy Lab (NREL) on Jan.8, 2020 as a follow-up to the previous US patent submitted in 2019 related to the Nature paper. Inventor: Tao Xu and Kai Zhu. Ownership: National Renewable Energy Lab and Northern Illinois University. This international patent has been published on 12/03/2020, Publication No.: WO 2020/242539 A1. [https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2020242539&\\_cid=P11-KLA27U-07725-1](https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2020242539&_cid=P11-KLA27U-07725-1)
9. “Materials for stabilizing semiconductors and methods of making the same” published by the United States Patent & Trademark Office (USPTO) on May 12, 2022. Inventors: Kai Zhu, Fei Zhang and Tao Xu. Owner: NREL and NIU, Publication No.: US 2022/0148818 A1, Application No.: 17/517,830
10. US provisional patent submitted via National Renewable Energy Lab (NREL) on Nov.7, 2020, titled METHODS FOR STABILIZING PEROVSKITES, Inventors: Kai Zhu, Tao Xu, Xun Li, ownership: National Renewable Energy Lab and Northern Illinois University, application # 63/067,384.
11. International PCT patent Application (Serial NO. PCT/US2020/28297), titled “Doped lithium anode, battery having a doped lithium anode, and methods of use thereof” submitted on June 29, 2020, NIU file No. 19-003, Inventors: Yingwen Cheng, Tao Xu, Ke Lu, Haiping Xu, ownership: Northern Illinois University.

12. An US provisional patent submitted via Argonne National Laboratory (ANL) in July, 2020, titled “Method of preparing electrocatalysts for converting carbon dioxide to chemicals”, Inventors: Di-Jia Liu, Tao Xu, Haiping Xu, ownership: Argonne and NIU. ANL Atty. Dkt. No.: 051583-0935 (ANL-IN-20-003).
13. “Method of preparing electrocatalysts of converting carbon dioxide to glycerol” DI-JIA LIU, TAO XU, JIANXIN WANG, ownership: Argonne and NIU, Invention record ANL-IN-22-087.
14. “Highly efficient and durable on-device metal sequestering tapes for solar cells and modules”, PCT Application No.: PCT/US22/73991, Inventors: Kai Zhu and Tao Xu, Filed by National Renewable Energy Lab on July 21, 2022. Ownership: NREL and NIU.
15. “Sequestering compositions and materials” published by the United States Patent & Trademark Office (USPTO) on Jan. 27, 2022. Inventors: Kai Zhu, Tao Xu. Ownership: NREL and NIU, Publication No.: US 2022/0024954 A1, Application No.: 17/498,268
16. “Methods for stabilizing perovskites” published by the United States Patent & Trademark Office (USPTO) on Feb. 24, 2022. Inventors: Kai Zhu, Jinhui Tong, Tao Xu and Xu Li. Owner: NREL and NIU, Publication No.: US 2022/00059780 A1, Application No.: 17/406,275
17. Provisional patent titled “Bilayer electrodes for perovskite solar cells” filed on April 7, 2023 at the United States Patent & Trademark Office (USPTO) and has received Application No. 63/494,873. Inventors: Kai Zhu, Soyeon Park, Tao Xu. Owner: NREL and NIU,

#### **Invited Colloquium Talks, Conference Oral Presentations and workshop presentation**

50. “Photo-Induced Spin-Spin Coupling in Doped Organic-Inorganic Hybrid Perovskites”, oral presentation at Division of Electronics, Optics and Photonics, Materials Research Society National Meeting Spring 2023, San Francisco, CA, USA on April 13, **2023**.
49. “In Situ X-Ray Absorption Study of Electrocatalytic Carbon Dioxide Conversion to Multicarbon Organic Liquids at High Single-Product Faradaic Efficiency and Low Over-Potentials”, oral presentation at Division of Characterization, Materials Research Society National Meeting Spring 2023, San Francisco, CA, USA on April 12, **2023**.
48. “Light-controlled spin coupling in doped hybrid perovskites”, oral presentation at Division of Energy and Fuels, American Chemical Society National Meeting Spring 2023, Indianapolis, Indiana, USA on March 28, **2023**.
47. “Lead sequestration for perovskite solar cells”, oral presentation at Division of Environmental Chemistry, American Chemical Society National Meeting Spring 2023, Indianapolis, Indiana, USA on March 28, **2023**.
46. “Electrocatalytic carbon dioxide conversion to multicarbon organic liquids at high single product Faradaic efficiency and low overpotentials”, oral presentation at Division of Catalysis

Science and Technology, American Chemical Society National Meeting Spring 2023, Indianapolis, Indiana, USA, on March 27, **2023**.

45. “Cold thoughts on perovskite fever”, **Invited** colloquium talk at Kent State University, Kent, Ohio, USA, Feb. 22, **2023**.
44. Virtual talk invited by Panasonic, America, “Dry air-stable and dendrite-free metal lithium anode for lithium battery” Oct. 2, **2022**.
43. Virtual talk invited by Panasonic, Japan, “Technology for tackling stability and toxicity in emerging perovskite solar cells” Jan. 7, **2022**.
42. Department of Energy, Advanced Manufacturing Office Electrochemistry in Manufacturing - Virtual Workshop Series  
June 15, 2021- Electrochemistry overview and DOE’s interests, Active Participant  
June 17, 2021 - Manufacturing applications for electrochemistry, Active Participant  
Presented “Electrochemical conversion of CO<sub>2</sub> to value-added organic liquids”  
June 22, 2021- R&D Needs for EChem deployment Active Participant  
June 29, 2021- Electrochemistry innovation ecosystem and cross-cutting enablers, Active Participant
41. Virtual talk invited by Corning Glass, Corning Innovation Center “Sequestration coating technology and critical glass technology for perovskite solar cells” July 25, **2021** 9:30am - 10:30am (Eastern Time)
40. “Dopants, Isotope, Pressure and Lead Sequestration for Hybrid Perovskite Materials”, Control ID: 3453932, Symposium: F.EL08: Frontiers of Halide Perovskites—Linking Fundamental Properties to Devices, recorded oral presentation (**Invited**) at Materials Research Society Fall National Meeting, virtual due to COVID19 pandemic, Nov.27-Dec.4, **2020**.
39. “Electronegativity-Guided Atomic Doping for Air-Stable and Dentrite-Free Li Metal Anode”, Control ID: 3481932, Symposium: F.EN03: Overcoming the Challenges with Metal Anodes for High-Energy Batteries, recorded oral presentation (**Invited**) at Materials Research Society Fall National Meeting, virtual due to COVID19 pandemic, Nov.27-Dec.4, **2020**.
38. “Electrochemical conversion of CO<sub>2</sub> to fuels catalyzed by top-down synthesized supported metals”, Division of Energy and Fuels, **Invited** oral presentation at American Chemical Society National Meeting, Fall 2020, Virtually, USA on August, **2020**.
37. “Tackling the challenges in hybrid perovskite solar cells”, Division of Energy and Fuels, oral presentation at American Chemical Society National Meeting, Fall 2020, Virtually, USA on August, **2020**.
36. “Cold thoughts on perovskite fever”, **Invited** talk (converted to online due to COVID19) for Illinois Solar Decathlon at the University of Illinois at Urbana-Champaign, Illinois, USA, April. 23, **2020**.

35. “Cold thoughts on perovskite fever”, **Invited** Webinar talk for Illinois Sustainable Technology Center (ISTC), a part of the Prairie Research Institute at the University of Illinois at Urbana-Champaign, Illinois, USA, Nov. 4, **2019**. The webinar is available at [https://www.istc.illinois.edu/events/sustainability\\_seminars](https://www.istc.illinois.edu/events/sustainability_seminars).
34. “Photocatalytic water disinfection by rationally doped titania nanostructures and electrocatalytic synthesis of value-added fuels from CO<sub>2</sub> (final paper number: ENFL 557)”, Division of Energy and Fuels, SESSION: Sustainable Energy & Water via Innovative Electrocatalytic, Photocatalytic & Hybrid Catalytic Systems, **Invited** oral presentation at American Chemical Society National Meeting, Fall 2019 in San Diego, CA, USA on August 28, **2019**.
33. “Ion-free and organic-free synthesis of supported metal electrocatalysts”, Division of Energy and Fuels, **Invited** oral presentation at American Chemical Society National Meeting, Orlando, Florida, USA on April 01, **2019**.
32. “Effects of dopants and pressure on the stability and optoelectronics of hybrid perovskite materials”, Division of Energy and Fuels, Oral presentation at American Chemical Society National Meeting, Orlando, Florida, USA on April 01, **2019**.
31. “Cold thoughts on perovskite fever”, **Invited** colloquium talk at Department of Chemistry, Middle Tennessee State University, Murfreesboro, TN, USA, Feb. 21, **2019**.
30. “Cold thoughts on perovskite fever”, **Invited** colloquium talk at Department of Physics and Astronomy, Valparaiso University, Valparaiso, Indiana, IN, USA, Sept. 21, **2018**.
29. “Synchrotron X-ray study of metal nanoparticles synthesized via metal-in-Li solutions”, **Invited** Oral Presentation at American Chemical Society National Meeting, New Orleans, LA, USA on March 22, **2018**.
28. “Cold Thoughts on Perovskite Fever” **Invited** colloquium talk at Department of Chemistry, University of South Dakota, Vermillion, SD, USA, Oct. 30, **2017**.
27. “Cold Thoughts on Perovskite Fever”, **Contributed** Oral Presentation on 44th IEEE Photovoltaic Specialist Conference, Washington D.C. USA on June 28, **2017**.
26. “Cold Thoughts on Perovskite Fever” **Invited** colloquium talk at Department of Chemistry, University of South Dakota, Vermillion, SD, USA, Oct. 30, **2017**.
25. “Cold Thoughts on Perovskite Fever”, Oral Presentation on 44th IEEE Photovoltaic Specialist Conference, Washington D.C. USA on June 28, **2017**.
24. “Exploring new opportunities in organic-inorganic hybrid perovskites”, **Invited** Oral Presentation at American Chemical Society National Meeting, San Francisco, CA, USA on April 04, **2017**.

23. “Exotic syntheses of supported metal nanoparticles via metal-in-Li solutions”, **Invited** Oral Presentation at American Chemical Society National Meeting, San Francisco, CA, USA on April 02, **2017**.
22. “Cold Thoughts on Perovskites Fever”, Tao Xu, **Invited** colloquium talk at The University of South Florida, Tampa, FL, USA on Nov. 3, **2016**.
21. “Cold Thoughts on Perovskites Fever”, Tao Xu, **Invited** Oral Presentation at American Chemical Society National Meeting, Philadelphia, PA, USA on August 21, **2016**. Awarded as the “Best Presentation” of Energy and Fuel Session.
20. “Tackling the Grand Challenges Facing Perovskites Solar Cells”, Tao Xu, **Invited** Oral Presentation at American Chemical Society National Meeting, San Diego, CA, USA on March 14, **2016**.
19. “Tackling the Grand Challenges Facing Perovskites Solar Cells”, Tao Xu, Oral presentation, Materials Research Society National Meeting, Boston, MA, USA on Nov. 30, **2015**.
18. “Perovskite solar cells---the renaissance of a known dye sensitizer for next generation photovoltaics” Tao Xu, **Invited** colloquium talk by Taipei University of Technology, Taipei, ROC, May 22<sup>nd</sup>, **2015**.
17. “Perovskite Solar Cells---The Renaissance of A Known Dye Sensitizer for Next Generation Photovoltaics”, **Invited** Keynote Talk, Second International Conference on Sustainable Urbanization, Hong Kong, on January 9, **2015**.
16. “3D nanoarchitected TCO for drift-transport in liquid electrolyte-based dye-sensitized solar cells”, **Invited** oral presentation on American Chemical Society National Meeting in Dallas, TX, USA on March 18, **2014**.
15. “Direct Doping of Pd Nanocatalysts in Complex Metals for Enhanced Hydriding Kinetics”, **Invited** oral presentation on American Chemical Society National Meeting in Indianapolis, IN, USA on Sept.9th **2013**.
- 14 “Three-Dimensional Nanoarchitected Transparent Conducting Oxides for Photovoltaics”, **Invited** oral colloquium presentation at The Xinjiang Technical Institute of Physics & Chemistry, Chinese Academy of Science, July 1-2, **2013**
13. “Surfactant-free Synthesis of monometallic and Multimetallic Precious Metal Nanoparticles”, **Invited** colloquium talk by the Shanghai Institute of Ceramics, Chinese Academy of Science, June 18-19, **2013**.
12. “Advancing Beyond Current Generation of Photovoltaics and Electrochromics for Building Energy Efficiency”, **Invited** colloquium talk by The Hong Kong Polytech University, Hong Kong, June 15, **2013**.
11. “Synthesis of Bimetallic Nanoalloys Directly from The Corresponding Bulk Alloys:

An Organic-Free Process”, **Invited** seminar talk by Argonne National Laboratory, Catalysis Club, Argonne, IL, USA, June, 11, **2013**.

10. “Synergistic Enhancement of Charge transport and Light Harvesting in Nanoarchitected Photoelectrochemical Systems”, **Invited** colloquium talk by State Key Lab for Crystal Materials, Shangdong University, China, Oct. **2011**.
9. Xu, T.\* Gao, S.; “Rational Designs on TiO<sub>2</sub>-based Nanocomposites for Solar Photocatalytic Purification” Oral presentation on Materials Research Society National Meeting, San Francisco, CA, April 27, **2011**.
8. “Strategic Photoelectrochemical Nanoarchitectures for Dye-Sensitized Solar Cells and Photocatalytic Oxidation”, **Invited** colloquium presentation by Chinese Academy of Science, Institute of Chemistry, Beijing, China, May, 28, **2010**.
7. “Novel Device Fabrication and Synthesis of Nanostructured Precious Metals for Hydrogen Detection, Storage and Fuel Cell Applications”, **Invited** colloquium talk by National Renewable Energy Laboratory, Golden, CO, USA April 9, **2010**.
6. “Comprehensive Interface Advancements for High-Efficient Dye-Sensitized Solar Cells”, **Invited** colloquium talk by Department of Materials Science and Engineering, University of Utah, Salt Lake City, UT, USA, April 7, **2010**.
5. “New Nanoscale Interfaces for Hydrogen Detection and Dye-Sensitized Solar Cells”, **Invited** colloquium talk by Department of Chemistry, Southern Illinois University, Carbondale IL, USA, April 2, **2010**.
4. “New Nanoscale Interfaces for Hydrogen Detection and Dye-Sensitized Solar Cells”, **Invited** colloquium talk by Department of Chemistry, University of Illinois at Chicago, IL, USA, March 4, **2010**.
3. “Rapid Hydrogen Detection by Nanoscale Palladium and Quantitative Measurement of Hydrogen Uptake Using A Quartz Crystal Microbalance”, **Invited** colloquium talk by School of Materials Engineering, Purdue University, West Lafayette, IN, USA, March 21, **2008**.
2. “Fast Hydrogen Sensors Based on Nanoscale Palladium”, **Invited** oral presentation on Fifteenth Annual International Conference on Composites and Nano Engineering, Session 16a, Hainan Island, China, July 15-21, **2007**.
1. “Hydrogen Sensor and Storage Materials”, Invited oral presentation on American Chemical Society Regional Meeting at Rockford College, Rockford, IL, March 19, **2007**.

#### **Invited Poster Presentations**

3. “Scalable Integration of CO<sub>2</sub> Capture and Electrocatalytic Conversion to Organic Liquids” on U.S. Department of Energy, Energy Efficiency and Renewable Energy (EERE), Advanced Manufacturing and Materials Technology Office (AMMTO) & Industrial Efficiency and

Decarbonization Office (IEDO) joint peer review workshop, Washington, D.C. May 16th-18th, **2023**.

2. “Nanoarchitected Photoelectrodes for Enhanced Charge Transport in Dye-Sensitized Solar Cells” The 4<sup>th</sup> International Conference on The Industrialization of Dye-Sensitized Solar Cells, Colorado Spring, CO, USA, Nov.1-4, **2010**
1. “Strategic Photoelectrodes for Enhanced Electron Transport in Photovoltaic Devices”, National Science Foundation, MERSEC Center Workshop on Electronic Transport in Nanoengineered Materials, University of Chicago, Sept. 16-18, **2010**

**Representative Synergistic Activities and Community Outreach:**

25. “Fueling the Future with Renewable Energy” presented at Board of Northern Illinois University Research Foundation, on Dec. 13, 2021.
24. Representing NIU faculty to present high-impact research work titled “Fueling the Future with Renewable Energy”, presented at Board Of Trustee Meeting, Northern Illinois University, on Nov. 18, 2021.  
<https://live.media.niu.edu/video/archive/BOT/2021/BOT211118/211118RILLA.mp3>  
(starting from 38’:38’)
23. “Fueling the Future with Renewable Energy” presented at Northern Illinois University STEM Café on May 12, 2021. This is an outreach effort for NIU.  
[https://calendar.niu.edu/event/stem\\_cafe\\_fueling\\_the\\_future\\_with\\_renewable\\_energy#.YMTvc\\_lKg2wVII](https://calendar.niu.edu/event/stem_cafe_fueling_the_future_with_renewable_energy#.YMTvc_lKg2wVII).
22. Work together with Dr. Anna Quider, Assistant Vice President for Federal Relations of NIU, and Dara Little Assistant Vice President for Sponsored Programs Administration to brainstorm and compile a response to the Request for Information (RFI DE-FOA-0002540) on Inclusive Innovation and Entrepreneurship in Climate Technology from the U.S. Department of Energy.
21. Initialize and organize departmental response to University’s emerging research initiative <https://www.niu.edu/divresearch/emerging-research-initiatives/index.shtml>. As the elected Director of the proposed ERI center, originally named as Sustainable Energy and Environmental Development (SEED) Initiative, now changed to Northern initiative for Clean Energy Research (NICER), Xu wrote the proposal and organize the founding members (Xu, Wheeler, Cheng, Nesterov, Li, now including Brown from Physics and Vahabzadeh from Engineering) meetings, prepared and defended the interview by university administration on . Our proposal has been selected in the final run. The proposed initiative include faculty members from Chemistry, Physics and Engineering.
20. University service: Requested by Luke M. Seby, Director of Innovation Partnerships and Technology Transfer, Division of Research and Innovation Partnerships, Xu represent NIU to attend the Air Force Warfighting Integration Capability Energy Challenge Definition Workshop, Dates: Tue, Aug 18, 2020 – Thu, Aug 20, 2020, location virtual, 4 hours/day, total 12 hours.

19. Representing Northern Illinois University on **Congressional** Energy and Environment Innovation Showcase on 12/9, Washington D.C. USA, Dec. 9-10, **2019**.  
<https://www.niutoday.info/2019/12/11/nius-tao-xu-participates-in-d-c-innovation-showcase/>
18. As a selected research-active faculty representative of NIU to attend the forum with Congressman Adam Kinzinger (member of Committee on Energy and Commerce) during his visit to NIU on 7/31/2018. My students and I exemplified the importance of federal investment in world-class scientific facilities such as Argonne's Advanced Photon Source, its impact to our students research and employment evidenced by the world-class scientific accomplishment achieved by our students. As quoted by news media, we "made it clear during this visit that national labs remain important to local and federal education and research." July 31, **2018**
17. Editorial board members for Energies, <https://www.mdpi.com/journal/energies/editors> since **2018**.
16. Session Chair of "Physical properties and characterization of perovskite PV" at 2016 IEEE 43rd Photovoltaic Specialists Conference (PVSC), Portland, OR, USA, June 5-10, **2016**.
15. Coached (Jan-May, 2016) the Illinois Science Olympiad Team for Meadow Glen Elementary School (A National Blue Ribbon School awarded by the U.S. Department of Education), and the team won 4 First Place Awards among all 10 competition programs participated in by the elementary schools in the Chicago suburban area. May, 7, **2016**
14. Recruitment colloquium "The Black and White Issue in Titanium Oxide", Department of Natural and Health Sciences, University of St. Francis, Concordia University-Chicago, and Associated Colleges of the Chicago Area (ACCA) Seminar Series, March 25th, **2014**.
13. Guest Editor for International Journal of Photoenergy in **2013-2014**.
12. Recruitment colloquium "3-D Transparent Conducting Oxides (TCO) Nanoarchitectures for Photovoltaic Solar Cells", Department of Chemistry, University of Wisconsin La Crosse, La Crosse, WI, April 26th, **2013**.
11. NIU STEM Outreach and Energy and Environment Workshop(Sponsored by Xu's NSF Career Project) presented "Making Stuff Smaller," an exploration into the world of nanotechnology and materials science, in Sycamore, IL, October 23, **2012**.
10. Recruitment colloquium "Synergistic Enhancement of Charge transport and Light Harvesting in Nanoarchitected Photoelectrochemical Solar Cells", Department of Chemistry, Eastern Illinois University, Charleston, IL, March. 28th, **2012**.
9. Recruitment colloquium "Advancing beyond Current Configuration of Dye-Sensitized Solar Cells", Department of Chemistry, University of Illinois at Springfield, IL, Sept. 29th, **2010**.
8. Recruitment colloquium "New Nanoscale Interfaces for Hydrogen Detection and Dye-Sensitized Solar Cells", Department of Chemistry and Environmental Sciences, Southern Illinois University at Edwardsville, IL, Dec. 9th, **2009**.

7. Physical Chemistry Session Chair for The 20<sup>TH</sup> Argonne Annual Undergraduate Symposium, Argonne National Laboratory, Argonne IL, Nov. 13, **2009**.
6. NIU Chemistry Open House Demonstration to Local High School Students and Teachers, Dekalb, IL, November 11, **2008**.
5. Materials Science Session Chair for The 19<sup>TH</sup> Argonne Annual Undergraduate Symposium, Argonne National Laboratory, Argonne IL, Nov. 7, **2008**.
4. “Self-Assembled Monolayers for Stiction Reduction in Micromachines” Tao Xu, Micro Assembly Systems Training Workshop, DeKalb, IL, December 10, **2007**,).
3. “Introduction to Nanoscale Materials” Tao Xu, Project Lead The Way, Meeting with High School Teachers in Chicago Suburban, DeKalb, IL, Nov. 9, **2007**.
2. Session Chair for Fifteenth Annual International Conference on Composites/Nano Engineering (ICCE), Hainan Island, China July 19, **2007**.
1. Community outreach: participated the production of educational video for introducing hydrogen economy and hydrogen sensors to Chicago area high schools through Argonne Division of Education Program, Argonne National Laboratory, Feb-April **2006**.

**Professional Service:**

1. Frequent reviewers for journals from American Chemical Society, Nature Publishing Group, Science, Wiley, Royal Society of Chemistry, Elsevier etc.
2. Frequent reviewers for proposals from the U.S. National Science foundation, Department of Energy, Department of Defense, American Chemical Society Petroleum Research Fund.