Dr. Yan Yao

Hugh Roy and Lillie Cranz Cullen Distinguished Professor
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https://www.ee.uh.edu/faculty/yao-yan

Professional Experience

2022–Present	Hugh Roy and Lillie Cranz Cullen Distinguished Professor Department of Electrical and Computer Engineering, Chemical and Biomolecular Engineering (Affiliated) & Materials Science and Engineering Program (Affiliated) University of Houston, Houston, TX
2012–Present	Principal Investigator, Texas Center for Superconductivity (TcSUH)
2020–2022	Professor Department of Electrical and Computer Engineering, Chemical and Biomolecular Engineering (Affiliated) & Materials Science and Engineering Program (Affiliated) University of Houston, Houston, TX
2017–2020	Associate Professor (with Tenure) Department of Electrical and Computer Engineering, Chemical and Biomolecular Engineering (Affiliated) & Materials Science and Engineering Program (Affiliated) University of Houston, Houston, TX
2012–2017	Assistant Professor Department of Electrical and Computer Engineering, Materials Science and Engineering Program (Affiliated) University of Houston, Houston, TX
2010–2012	Postdoctoral Scholar, Department of Materials Science and Engineering Stanford University, Stanford, CA
2008–2010	Senior Scientist, Polyera Corporation, Skokie, IL
2003–2008	Research Assistant, Department of Materials Science and Engineering University of California, Los Angeles, CA

Education

University of California Los Angeles, Los Angeles, CA
Ph.D. in Materials Science and Engineering, 2003–2008

Fudan University, Shanghai, China
M.S. in Materials Science, 2000–2003
B.S. in Materials Science, 1996–2000

Research

Professor Yao is a globally recognized leader in the field of electrochemical energy storage and conversion, particularly for his innovative work on beyond lithium-ion battery chemistries. His research bridges electrochemistry with materials design and synthesis, with a focus on multivalent, solid-state and aqueous batteries, which offer higher safety, sustainability, and lower environmental impact. He has successfully

secured over $20 million in research funding from prestigious sources such as the DOE, ARPA-E, NSF, ONR, and various industry partners. He serves as the Principal Investigator for several core battery programs, including the Battery500 Consortium, the Vehicle Technology Office's Battery Materials Research program, the Basic Energy Science's Battery Hub, and three ARPA-E projects. A summary of his prominent achievements follows.

- **Multivalent Metal-ion Batteries**

  - Developed a high-power, fast-charging magnesium battery utilizing heterogeneous enolization chemistry and a weakly coordinating electrolyte (Nature Energy, 2020). In 2021, co-founded LiBeyond LLC to commercialize this technology, receiving a $3.4M grant from ARPA-E for scaling up Lithium- and Transition Metal-Free High-Energy Fast-Charging Batteries.
  - Discovered a novel battery chemistry using magnesium monochloride cations in expanded titanium disulfide (Nature Comm. 2017). This research sheds light on complex ion diffusion in layered materials, considering interlayer distance and chemical interactions. This work was highlighted in the 2017 Advanced Photon Source Science Report.
  - Authored a review paper, "Current status and future directions of multivalent metal-ion batteries"(Nature Energy, 2020), accruing over 700 citations since its publication.

- **Solid-State Sodium and Lithium Batteries**

  - Pioneered the use of tailored organic electrode materials compatible with ceramic-based solid electrolytes for all-solid-state sodium batteries (Angew. Chem. 2018, Cover). Demonstrated that soft, highly malleable organic cathode materials (e.g. pyrene-4,5,9,10-tetraone) maintain conformal interfacial contact with solid electrolytes during cycling, mitigating chemomechanical instability without high stacking pressure (Joule, 2019). This innovation in organic cathodes for solid-state sodium batteries has been featured by Science, UH, ChemEurope, Phys.Org among others.
  - Uncovered a novel oxysulfide glass electrolyte for all-solid sodium batteries, offering low cost, ease of fabrication, and exceptional mechanical and chemical stability (Nature Comm. 2022). Employed a high-energy ball milling process to create the electrolytes at room temperature, resulting in a homogeneous glass structure. The solid electrolyte forms a self-passivating interphase, essential for reversible sodium plating and stripping. This research has been covered by Nature Energy, UH, Fast Company, InsideClimate News, and others.
  - Demonstrated organic electrode materials for all-solid-state lithium batteries (ACS Energy Lett. 2021; Joule 2021). Revealed the unique interphase chemistry between pyrene-4,5,9,10-tetraone and lithium thiophosphate, introducing a potential-dependent reversible interphase evolution model. Highlighted the importance of microstructure engineering for all-solid-state batteries. Presented a roadmap for solid-state organic batteries to reach 500 Wh kg^{-1} (ACS Energy Lett. 2021). This research has been covered UH, Science Daily, ClimateChange, and others.

- **Aqueous Batteries**

  - Identified ultrafast proton coupled electron transfer in quinone solids, investigated the fundamental science and molecular design for long cycle-life of aqueous batteries (Nature Materials, 2017). Holds three patents for using organic materials as negative electrodes in acidic, neutral pH, and alkaline batteries, offering alternatives to lead and metal hydride anodes. This work was featured by Nature Energy, UH, New Electronics etc, accruing over 600 citations since its publication.
  - Investigated the charge storage mechanism of a quinone polymer through a combination of electrochemical quartz crystal microbalance monitoring and in situ Fourier transform infrared

spectroscopy (J. Electrochem. Soc. 2020). This study found non-hydrated zinc ions to be the key cation species in the quinone-related redox reactions.
- Published a comprehensive review paper (Nature Review Materials, 2022), providing a holistic and critical overview of modern aqueous battery design.

- **Operando Characterization Tools**

- Developed an operando SEM platform for monitoring interface evolutions during solid-state battery operation with Prof. Zheng Fan, ranked top 3 in the 2021 annual merit review of the Vehicle Technology Office (batt489). Co-founded Solid Design Instruments to commercialize this tool.
- Reported an operando reflection interference microscope with Prof. Xiaonan Shan, enabling real-time imaging of the solid–electrolyte interphase formation and evolution processes with high sensitivity (Nature Nano. 2023).

- **Organic Batteries**

- Authored influential reviews on organic electrodes for electrochemical energy storage (Joule 2018; Chemical Reviews, 2020).
- Developed π-conjugated redox polymers with ultrafast energy storage capability (JACS, 2015). This work was featured as an Editors' Choice and JACS spotlight, UH, and others.

Awards and Recognitions

- **Texas Academic Leadership Academy Fellow** (2023)
- **Hugh Roy and Lillie Cranz Cullen Distinguished Professor** – University of Houston (2022)
- **TAMEST Protégé Program** – TAMEST (2022)
- **Senior Level Research Excellence Award** – Cullen College of Engineering (2022)
- **Excellent Paper of the Year** – International Mg Society (2021)
- **Fellow of Royal Chemical Society** (2020)
- **Senior Member of National Academy of Inventors** (2020)
- **Cullen College of Engineering Professorship** – College of Engineering (2020–2022)
- **50-in-5 Scholars** – University of Houston (2021, 2020, 2019, 2018)
- **Emerging Investigators in Electrochemical Energy Conversion and Storage** – Journal of Electrochemical Energy Conversion and Storage (2020)
- **Senior Member of IEEE** (2019)
- **Top 1% Highly Cited Researchers List** – Clarivate Analytics (2018)
- **Award for Excellence in Research, Scholarship, or Creative Activity** – University of Houston (2018)
- **Scialog Fellow on Advanced Energy Storage** – Research Corporation (2017)
- **Junior Level Research Excellence Award** – University of Houston Cullen College of Engineering (2016)
- **Teaching Excellence Award** – University of Houston Cullen College of Engineering (2016)
- **Office of Naval Research Young Investigator Award** – U.S. Office of Naval Research (2013)
- **Principal Investigator** – Advanced Research Projects Agency-Energy (2013, 2015, 2022)
- **Ralph E. Powe Junior Faculty Enhancement Award** – Oak Ridge Associated Universities (2013)

- **TcSUH Welch Foundation Professorship Award** – The Welch Foundation (2012)
- **Excellence in Graduate Polymer Science Research** – American Chemical Society (2008)
- **Chinese Government Award for Outstanding Students Abroad** – Chinese Scholarship Council (2007)
- **ICI Student Award Finalist in Applied Polymer Science** – American Chemical Society (2007)
- **Dissertation Year Fellowship** – UCLA (2007)
- **Chun–Tsung Scholar** – Chun–Tsung Endowment (2000)
- **Outstanding Undergraduate Student Award** – Shanghai Education Council (2000)

Student Awards and Honors

- 2023 Poster Award, 2nd Texas Pore Engineering Conference, Wen Ren
- 2023 UH Energy Scholars Program, Sadia Ashraf
- 2023 Third Prize, TcSUH 58th Student Research Symposium, Chaoshan Wu
- 2022 UH Postdoc Travel Award, Lihong Zhao
- 2022 TcSUH Travel Grant, Zhaoyang Chen
- 2020 Best Dissertation Award in Chemical Engineering, Karun Kumar Rao
- 2020 Houston Science Engineering Fair Second Place, Stephane Xie
- 2020 UH Provost's Undergraduate Research Scholarship, Robert Sipowicz
- 2019 Best Dissertation Award, Fang Hao
- 2019 Best Poster Award of Battery500 Review Meeting, Dieu Nguyen
- 2019 5th Solid State Battery Symposium, Best Poster Award, Yang Chen
- 2019 Best Paper Award, 235th ECS meeting Battery Division, Fang Hao
- 2019 Houston Endowment Fellowship, Dieu Nguyen
- 2019 NSF Graduate Research Fellowship, Audrey Wang
- 2019 UH Future Faculty Program Travel Award, Fang Hao
- 2019 Third Place, TcSUH 56th Student Symposium, Audrey Wang
- 2019 UH Summer Undergraduate Research Fellowship, Robert Sipowicz
- 2019 Cynthia Oliver Coleman Women in Engineering Rising Star Award, Audrey Wang
- 2019 Outstanding Senior in Electrical Engineering, Audrey Wang
- 2018 Audience Favorite Poster Award, UH Undergraduate Research Day, Audrey Wang
- 2018 Nature Conference of Electrochemistry Best Poster Award, Hui Dong
- 2017 NASA Space Technology Research Fellowship, Karun Kumar Rao
- 2017 TcSUH Travel Award, Fang Hao
- 2017 DOE Science Undergraduate Laboratory Internship, Stephanie Roohi
- 2017 Provost's Undergraduate Research Scholarship, Stephanie Roohi
- 2017 First Place, TcSUH 53rd Student Symposium, Saman Gheytani
- 2016 Best Dissertation Award, Materials Science and Engineering, Yifei Li
- 2016 Third Prize, TcSUH 52nd Student Symposium, Fang Hao
- 2016 Best Poster Award, NSF REEMS REU, Raymond McCoy
- 2016 TcSUH Travel Award, Hui Dong

- 2016 UH Future Faculty Program, Hui Dong
- 2016 Third Prize, TcSUH 51st Student Symposium, Hui Dong
- 2015 Nano Research Poster Award, Yanliang Liang
- 2015 UH Summer Undergraduate Research Fellowship, Kayshewa Champathi
- 2014 University of Nebraska-Lincoln New Venture Competition, Energetik Team
- 2014 ECE Urvish Medh Award, Yifei Li
- 2014 UH Summer Undergraduate Research Scholarship, Matthew Patton
- 2014 Third Prize, TcSUH 47th Student Symposium, Yifei Li
- 2013 UH Summer Undergraduate Research Fellowship, David Pineda

Research Funding

Ongoing Projects ($13.5M Total, External: $7.7M)

PI DOE Basic Energy Science, Title: Energy Storage Research Alliance (ESRA), University of Houston PI, subcontract from Argonne National Laboratory, **$2,500,000**, Period: 9/1/2023 – 8/31/2028 (*pending final paperwork*)

PI DOE Vehicle Technology Office, Title: Battery500 Consortium: Scalable Noble-metal-free Interlayer Design for Sheet-type Dendrite-free Solid- state Lithium Metal Batteries, **$900,000**, Period: 4/24/2023 –2/24/2026

PI DOE Vehicle Technology Office, Title: Halide based superionic solid electrolytes and high voltage cathode interfaces, subaward from Oak Ridge National Lab, **$500,000**, Period: 4/26/2022 – 4/25/2027

PI DOE ARPA-E, Title: OPEN 2021: Lithium- and transition metal-free high-energy fast-charging batteries, **$3,400,000**, Period: 6/27/2022 – 6/26/2025

PI Meta, Title: Bioderived and biodegradable redox polymers for flexible wearable batteries, **$150,000** (gift), Period: 4/1/2022 – 9/30/2024

PI Underwriter Laboratory Research Institutes, Title: Selective membranes for magnesium-ion conduction, **$240,000**, Period: 9/01/2022 – 8/31/2024

PI University of Houston, Title: Solid-state battery prototyping facility, $**5,540,000**, Period: 10/01/2023 – 9/30/2025

PI University of Houston, Title: SEED Grant: Ultrasonic based monitoring and characterization of Li-metal batteries, **$70,000**, Period: 6/01/2022 – 8/31/2024

PI Texas Center for Superconductivity at UH, Title: Developing high-energy all-solid-state batteries with alloying anodes, **$52,000**, Period: 9/01/2023 – 8/31/2024

PI University of Houston, Title: Large Equipment Program: Acquisition of a warm isostatic press to support on sustainable communities and infrastructure and energy security and transition, **$112,250**, Period: 4/1/2022 – 8/31/2024

Completed Projects ($12.5M Total, $5.9M as PI)

PI Office of Naval Research Young Investigator Award, Title: Developing multivalent ion intercalation batteries as high energy and safe marine distributed power sources, **$659,883**, Period: 05/01/2013 to 04/28/2017

PI DOE ARPA-E, Title: Aqueous lithium-ion batteries with high-energy novel organic anodes for safe and robust energy storage, **$1,013,170**, Period: 11/13/2013 to 08/12/2015

PI NSF, Title: SusChEM: Design and Manufacture of Electrodes for High Energy Density Rechargeable Sodium Batteries, **$353,297**, Period: 08/15/2014 to 07/31/2017

PI DOE Vehicle Technology Office, Title: High-energy solid-state lithium batteries with organic cathode materials, **$1,200,000**, Period: 10/01/2017 to 12/31/2021

PI DOE Vehicle Technology Office, Title: Multidimensional diagnostics of interface evolutions in solid-state lithium batteries, **$1,000,000**, Period: 10/01/2019 to 03/31/2023

PI Research Corporation of Science Advancement, Title: Scialog: Advanced Energy Storage Award, $**33,334**, Period: 03/01/2018 to 08/31/2019

PI Research Corporation of Science Advancement, Title: A porosity-free sodium glass electrolyte formed at room temperature, **$55,000**, Period: 02/1/2020 to 01/31/2022

PI Argonne National Laboratory, Title: Online electrochemical mass spectroscopy studies for advanced electrolytes in lithium-ion batteries, $**54,999**, Period: 9/1/2018 to 8/31/2019

PI Chaowei Power Corporation, Title: Room temperature solid state sodium battery, **$80,000**, Period: 11/01/2018 to 5/31/2020

PI Toyota Motor Engineering & Manufacturing of North America, Title: High energy density Mg batteries using ionic liquid electrolyte, **$299,999**, Period: 2/7/2019 to 6/31/2022

PI CNPC USA, Title: Technical analysis service agreement, **$226,000**, Period: 7/1/2019 to 6/30/2021

PI Giner Inc./DOE STTR, Title: Novel separator membranes for rechargeable high energy density Mg-Ion batteries, **$80,000**, Period: 2/14/2022 – 11/13/2022

PI LiBeyond/DOE SBIR, Title: Reliable fabrication of all-solid-state lithium batteries with high cell-level specific energy, **$60,000**, Period: 6/27/2022 – 4/26/2023

Co-PI Office of Naval Research, Title: DURIP: Physical property measurement system, **$810,000**, Period: 08/15/2015 to 08/15/2016

Co-PI DOE ARPA-E, OPEN 2015, Title: Low-cost, low-temperature, safe, high-energy-density solid-state Na batteries made from renewable materials, **$3,277,744**, Period: 06/01/2016 to 06/30/2018

Co-PI NASA, Graduate Student Fellowship for Karun Kumar Rao, **$286,642**, Period: 08/01/2017 to 12/16/2020

Co-PI Office of Naval Research, Title: DURIP: Micro-Computed Tomography (Micro-CT) for Non-destructive Evaluation of Advanced Materials and Devices for Defense Applications, **$904,554**, Period: 09/16/2020 to 09/15/2021

PI Texas Center for Superconductivity Funding, **$501,500**, Period: 09/1/2012 to 8/31/2023

PI University of Houston, Title: Tech Gap Fund 2018, **$26,595**, Period: 10/01/2018 to 10/1/2019

PI University of Houston, Title: Large Equipment Program: Acquisition of an atomic layer deposition system to support institutional thrusts on cyber and physical security, accessible healthcare, drug discovery and development, UH, **$124,964**, Period: 4/16/2018 to 4/15/2019

Co-PI University of Houston, Title: National Centers Planning Award, Houston Center for Advanced Materials and Manufacturing (H-CAMM), **$98,053**, Period: 3/15/2022 – 12/31/2022

Co-PI University of Houston, Title: GEAR, Chemistry Informed Deep Learning Based Battery Degradation Modeling for Microgrid Management (PI: Xingpeng Li), **$38,308**, Period: 5/15/2022 – 12/15/2023

Professional Services

- **Editorial Advisory Board**
  - Energy & Fuels, ACS (2023−Present)
  - Next Energy, Elsevier (2022−Present)
  - eScience, KeAi (2020−Present)
  - Scientific Reports, Nature Portfolio (2014−2018)
  - Academic editor for PLOS ONE (2018−Present)
  - Guest editor of Special Issue of Organic Batteries, Batteries & Supercaps (2023)
  - Guest editor of Special Issue of Energy Storage: Rechargeable Batteries Beyond Organic Electrolytes, Current Opinion in Electrochemistry (2021)
  - Guest editor of Special Issue of Organic Batteries, ChemSusChem (2020)

- **Professional Memberships and Service**
  - Board member, NATTBatt Sodium-ion Battery Committee (2023−Present)
  - Board member, Organic Battery Days (2017−Present)
  - Electrochemical Society Battery Division Member (2012−Present)
  - Materials Research Society (MRS) Member (2012−Present)
  - Materials Research Society Student Award Committee (2019)
  - Fellow of Royal Society of Chemistry (UK) (2019−Present)
  - Senior Member of Institute of Electrical and Electronics Engineers (IEEE) (2013−Present)
  - Treasurer, IEEE Nanotechnology Council Houston Chapter (2015−Present)
  - Senior Member, National Academy of Inventors (NAI) (2019−Present)

- **US Department of Energy Proposal Reviewer**
  - EERE, Vehicle Technology Office Annual Review (2023)
  - EERE, Office of Electricity Energy Storage Program (2023, 2021)
  - EERE, Office of Advanced Materials and Manufacturing Technologies Office (2023)
  - MESC, Bipartisan Infrastructure Law (BIL) Battery Materials Processing and Battery Manufacturing (2022)
  - BES, Chemical and Materials Sciences to Advance Clean Energy Technologies and Low-Carbon Manufacturing (2022)
  - BES, "Battery Hub" ($120M program) panel reviewer (2021)
  - BES, Energy Frontier Research Center ($16M program) (2018)
  - BES, Materials Chemistry Program (2023, 2022, 2019)
  - SBIR/STTR (2023, 2020, 2019)

- **US National Science Foundation Proposal Reviewer**
  - DMREF, Battery Science (2023)
  - DMR, Electronics/Photonics Materials (2022)
  - CBET, Electrochemical Systems (2020)

- **Other US Funding Agency**
  - ACS Petroleum Research Fund (2014−2020)
  - NASA Graduate Student Fellowship (2018)

- NASA EPSCoR Proposal (2015)
- AAAS on an Indo-US Joint Center on Solar Cells (2015)

- **International Funding Agency**
  - European Research Council Priority Grant (2023)
  - Germany Science Foundation (DFG) "Polymer-based batteries" priority program (2023)
  - Canada Ontario Research Fund (2022)
  - German-Israel Electrochemistry Proposal (2017)
  - European Research Council (2015)

- **Academic External Reviewer**
  - Nanyang Technology University proposal (2021)
  - City University of New York proposal (2021)
  - Hong Kong Polytechnic University proposal (2021)
  - Nazarbayev University Proposal (2019, 2020)
  - Qiu Shi Outstanding Young Scholar Award Committee (2017, 2019)
  - University of Maryland Industrial Partnership Program (2018)
  - Kentucky Science and Technology Corp. Proposal (2017)
  - Tenure and promotion candidate, Dartmouth College (2023)
  - Tenure and promotion candidate, University of Alberta (2023)
  - Tenure and promotion candidate, National University of Singapore (2023)
  - Tenure and promotion candidate, Washington University in St. Louis (2022)
  - Tenure and promotion candidate, University of Alberta (2022)
  - Tenure and promotion candidate, Ohio State University (2022)
  - Tenure and promotion candidate, Hong Kong University of Science and Technology (2022)

- **Manuscript Reviewer for Journals** (2012−Present)
  Science, Nature, Nature Energy, Nature Materials, Nature Nanotechnology, Nature Sustainablity, Nature Communications, Science Advances, Chemical Society Reviews, Chemical Reviews, Journal of American Chemical Society, Angewandte Chemie International Edition, Proceeding of the National Academy of Sciences, Energy and Environmental Science, Matter, Chem, Joule, Materials Today, Advanced Materials, Advanced Energy Materials, Advanced Functional Materials, ACS Energy Letters, ACS Materials Letters, ACS Nano, ACS Polymer Materials, Chemistry of Materials, Chemical Science, Cell Reports Physical Science, Electrochimica Acta, Energy Storage Materials, Journal of Materials Chemistry A, Nano Energy, Nano Letters, Nano Research, Scientific Reports, Small, Small methods.

- **Service to Electrochemical Society** University of Houston Student Chapter, Faculty Advisor (2016−Present)
  - 2017 ECS Grilling for Good Grades Event
  - 2017 ECS seminar speaker Dr. Kang Xu from Army Research Laboratory
  - 2019 ECS UH poster competition
  - 2022 Organic Battery Days workshop, highlighted at the Winter 2022 issue of Interface
  - 2023 ECS seminar speaker Dr. Sergiy Kalnaus from Oak Ridge National Laboratory
  - 2023 Na-Zn workshop with NATTBatt

- **Organizer of Professional Conferences**
  - Symposium Co-Organizer, MRS Spring Meeting, Solid State Batteries, Seattle, WA (2024)

- Conference Co-Organizer, NATTBatt Sodium and Zinc Battery Workshop, Houston, TX, USA (11/30-12/1/2023)
- Chair, Organic Battery Days 2022, Houston, TX, USA (2022)
- Conference Co-Organizer, Organic Battery Days, Tianjin, China (2018)
- Conference Organizer, Nature Conference on Materials Electrochemistry: Fundamentals and Applications, Shenzhen, China (2018)
- Symposium Co-Organizer, MRS Spring, "Organic Materials in Electrochemical Energy Storage", Phoenix, AZ (2019)
- Symposium Co-Organizer, European Materials Research Society, "Frontiers in Electrochemical Energy Storage", Strasbourg, France (2017)
- Symposium Co-Organizer, Electrochemical Society, "Electrochemistry and Batteries for Safe and Low-cost Energy Storage", 229th ECS meeting, San Diego, CA (2016)
- Symposium Co-Organizer, International Materials Research Congress, "Materials and Technologies for Stationary Electrochemical Energy Storage", Cancun, Mexico (2016)
- Symposium Lead-Organizer, MRS Fall, "Materials and Architectures for Safe and Low-cost Electrochemical Energy Storage Technologies", Boston, MA (2015)
- Symposium Co-Organizer TMS, "Nanostructured Materials for Rechargeable Batteries and for Supercapacitors III", Orlando, FL (2015)
- Symposium Co-Organizer, ACS, "Batteries and Fuel Cell Technologies: Challenges and Solutions, San Francisco, CA (2014)

- **Institutional Service**
  - Member of University of Houston Faculty Senate (2019−2022, 2023−Present)
  - Member of University Graduate & Professional Studies Committee (2019−2022, 2023−Present)
  - Member of University Intellectual Property Committee (2020−2023)
  - Cullen College of Engineering Promotion and Tenure Committee (2021, 2022, 2023)
  - Cullen College of Engineering Best Dissertation Award Committee (2019)
  - ECE Chair of Faculty Search Committee (2022, 2023)
  - ECE Post-tenure Review Committee (2020−2023)
  - ECE Faculty Governance Committee (2019−2022)
  - ECE Graduate Admission Committee (2014−Present)
  - Co-Director, Power electronics-Energy storage-Microgrids and Subsea Electrical Consortium (PEMSEC) at the University of Houston (2018−2022)

- **Outreach activities**
  - Advisor for 4 high school students conducting 6-week summer research (2023, 2013)
  - Host undergraduate summer research for Energy Scholar (2023)
  - NASA High School Aerospace Scholars (HAS) lab tour with hands-on activity (2019)
  - Program for Mastery in Engineering Studies (PROMES) Engineering Summer Camp lab tour with hands-on activity (2019)
  - NSF REU lab tour (2019)
  - Lemelson-MIT InvenTeams lab tour (2017)
  - Science and Engineering Fair of Houston judge (2022, 2021, 2020, 2016, 2015, 2013)

- International Sustainable World (Energy, Engineering & Environment) Project Olympiad (I-SWEEEP) International Science Fair judge (2017, 2014)

Publications

(a) Journal Articles: 140+ peer-reviewed papers in prestigious scientific journals including *Nature (x1), Nature Rev. Mater. (x1), Nature Energy (x3), Nature Mater. (x2), Nature Nano. (x2), Joule (x4), JACS (x5), Nature Comm. (x5), Adv. Mater. (x3), ACS Energy Lett. (x4), Nano Lett. (x5), ACS Nano (x5), Nano Energy (x9), et al.* According to Google Scholar, his work has received over 34,120 citations with an h-index of 71 as on 11/30/2023.

1. Alae Eddine Lakraychi, Erin Picton, Yanliang Liang, Devin Shaffer*, **Yan Yao***, *Suppressing Shuttle Effect with a Size-selective Covalent Organic Framework Based Bilayer Membrane*. **ACS Energy Lett**. 2023, 8, 5032-5040.
2. Hua Xie, Ning Liu, Qian Zhang, Hongtao Zhong, Liqun Guo, Xinpeng Zhao, Daozheng Li, Shufeng Liu, Zhennan Huang, Aditya Dilip Lele, Alexandra H. Brozena, Xizheng Wang, Keqi Song, Sophia Chen, **Yan Yao**, Miaofang Chi, Wei Xiong, Jiancun Rao, Minhua Zhao, Mikhail N. Shneider, Jian Luo, Ji-Cheng Zhao*, Yiguang Ju*, Liangbing Hu* *A stable atmospheric-pressure plasma for extreme-temperature synthesis*, **Nature**, 2023, 623, 964.
3. Lihong Zhao, Wei Li, Chaoshan Wu, Qing Ai, Liqun Guo, Zhaoyang Chen, Jie Zheng, Matthew Anderson, Hua Guo, Jun Lou, Yanliang Liang, Zheng Fan, Juner Zhu, **Yan Yao***, *Taming metal-solid electrolyte interface instability via metal strain hardening*. **Advanced Energy Materials**, 2023, 2300679.
4. Benjamin Emley, Chaoshan Wu, Lihong Zhao, Qing Ai, Yanliang Liang, Zhaoyang Chen, Liqun Guo, Tanguy Terlier, Jun Lou, Zheng Fan*, and **Yan Yao***, *Impact of fabrication methods on binder distribution and charge transport in composite cathodes of all-solid-state batteries*, **Materials Future**, 2023, 2, 045102. Focus Issue on Solid State Batteries.
5. Liqun Guo, Jie Zheng, Lihong Zhao*, **Yan Yao***, *Interfacial instabilities in halide-based solid-state batteries*, **MRS Bulletin**, 2023, 48, 1-10.
6. Hongzhi Zheng, Huan Li, Zisheng Zhang, Xiaojun Wang, Benjamin Emley, Ye Zhang, Hua Zhou, **Yan Yao*** and Yongye Liang*, *Dispersed nickel phthalocyanine molecules on carbon nanotubes as cathode catalysts for Li-CO_2 batteries*. **Small**, 2023, 2302768.
7. Alae Eddine Lakraychi, **Yan Yao***, *Designing organic pseudocapacitors through molecular hybridization*. **Joule**, 2023, 7, 858-860.
8. Chaoshan Wu*, Benjamin Emley*, Lihong Zhao, Yanliang Liang, Qing Ai, Zhaoyang Chen, Francisco C Robles Hernández, Fei Wang, Samprash Risal, Hua Guo, Jun Lou, **Yan Yao***, Zheng Fan*, *Understanding the chemomechanical function of silver-carbon interlayer in sheet-type all-solid-state lithium-metal batteries*. **Nano Lett.**, 2023, 23, 4415-4422.
9. Jianing Meng, Alexandra Robles, Jacobo Jalife Said, Wen Ren, Ye Zhang, Lihong Zhao, Yanliang Liang*, Judy Wu*, Ognjen Miljanić*, **Yan Yao***, *Cyclotetrabenzil derivatives for electrochemical lithium-ion storage*. **Angewandte Chemie**, 2023, e202300892.
10. Samprash Risal, Chaoshan Wu, Fei Wang, Sandesh Risal, Francisco C Robles Hernandez, **Yan Yao***, and Zheng Fan*, *Silver-carbon interlayers in anode-free solid-state lithium metal batteries: current development, interfacial issues and instability challenges*. **Carbon**, 2023, 213, 118225.

11. Sandesh Risal, Navdeep Singh*, Andrew Ian Duff, **Yan Yao**, Li Sun, Samprash Risal, Weihang Zhu*, *Development of RF-MEAM interatomic potential for Fe-C system to study temperature dependent elastic properties*, **Materials**, 2023, 16, 3779

12. Guangxia Feng, Hao Jia, Yaping Shi, Xu Yang, Yanliang Liang, Mark H. Engelhard, Ye Zhang, Chaojie Yang, Kang Xu*, **Yan Yao***, Wu Xu*, Xiaonan Shan*, *Imaging solid-electrolyte-interphase dynamics using in-operando reflection interference microscopy*, **Nature Nanotechnology**, 2023, 18, 780-789.

13. Qing Ai, Zhaoyang Chen, Boyu Zhang, Fan Wang, Tianshu Zhai, Yifeng Liu, Yifan Zhu, Tanguy Terlier, Qiyi Fang, Yanliang Liang, Lihong Zhao, Chaoshan Wu, Hua Guo*, Zheng Fan, Ming Tang, **Yan Yao***, Jun Lou*, *High-spatial-resolution quantitative chemo-mechanical mapping of organic composite cathodes for sulfide-based solid-state batteries*, **ACS Energy Letters**, 2023, 8, 1107-1113.

14. Kang Wang, Zih-Yu Lin, Zihan Zhang, Linrui Jin, Ke Ma, Aidan H. Coffey, Harindi R. Atapattu, Yao Gao, Jee Yung Park, Zitang Wei, Blake P. Finkenauer, Chenhui Zhu, Xiangeng Meng, Sarah N. Chowdhury, Zhaoyang Chen, Tanguy Terlier, Thi-Hoai Do, **Yan Yao**, Kenneth R. Graham, Alexandra Boltasseva, Tzung-Fang Guo, Libai Huang, Hanwei Gao, Brett M. Savoie, Letian Dou*, *Suppressing phase disproportionation in quasi-2D perovskite light-emitting diodes*, **Nature Comm.**, 2023, 14, 397.

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(b) Conference Proceedings

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(c) Edited Books Chapters

155. Hui Dong, **Yan Yao***, *Development of cathode materials for rechargeable magnesium batteries: from intercalation to enolization*, **Encyclopedia of Nanomaterials**, 2022, doi:10.1016/B978-0-12-822425-0.00087-7.

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(d) Patents and Patent Applications

Issued Patents (Total 12)

1. High ionic conductivity rechargeable solid state batteries with an organic electrode
   US Patent 11,621,420
   Inventors: **Yan Yao**, Yanliang Liang
2. Rechargeable alkaline battery using organic materials as negative electrodes
   US Patent 10,749,180
   Inventors: **Yan Yao**, Yanliang Liang
3. Lead-acid batteries with fast charge acceptance
   US Patent 10,522,875
   Inventors: **Yan Yao**, Yanliang Liang, Saman Gheytani, Yan Jing
4. Aqueous energy storage devices with organic electrode materials
   US Patent 10,411,262
   Inventors: **Yan Yao**, Yanliang Liang
5. Rechargeable alkaline battery using organic materials as negative electrodes
   US Patent 10,033,039
   Inventors: **Yan Yao**, Yanliang Liang
6. Non-lithium metal ion battery electrode materials architecture
   US Patent 9,745,205
   Inventors: **Yan Yao**, Yanliang Liang
7. Non-lithium metal ion battery electrode materials architecture
   US Patent 9,725,331
   Inventors: **Yan Yao**, Yanliang Liang
8. Conjugated polymers and their use in optoelectronic devices
   US Patent 8,748,739
   Inventors: Zhengguo Zhu, Martin Drees, Hualong Pan, **Yan Yao**, He Yan, Shaofeng Lu, Antonio Facchetti
   Licensed by Raynergy Tek Inc.
9. Conjugated polymers and their use in optoelectronic devices
   US Patent 8,598,449
   Inventors: Hualong Pan, He Yan, **Yan Yao**, Shaofeng Lu, Zhengguo Zhu, Antonio Facchetti
   Licensed by Raynergy Tek Inc.
10. Conjugated polymers and their use in optoelectronic devices
    US Patent 8,598,448
    Inventors: Shaofeng Lu, Antonio Facchetti, **Yan Yao**, Martin Drees, He Yan
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11. Pyrrolo[3,2-b]pyrrole semiconducting compounds and devices incorporating same
    US Patent 8,598,450
    Inventors: Hualong Pan, Martin Drees, Zhengguo Zhu, **Yan Yao**, Shaofeng Lu, Antonio Facchetti
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12. Conjugated polymers and their use in optoelectronic devices
    US Patent 8,334,456
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Patent Applications (Total 8)

13. **Yan Yao**, Xiaowei Chi, Solid electrolyte for sodium batteries, US Application 2021/0066748 A1.
14. **Yan Yao**, Hyun Deog Yoo, Method of activating two-dimensional materials for multivalent/polyatomic-ion intercalation battery electrodes, US Application 2018/0183038 A1.
15. **Yan Yao**, Hyun Deog Yoo, Method of activating two-dimensional materials for multivalent/polyatomic-ion intercalation battery electrodes, US Application 2021/0210742 A1.
16. Zheng Fan, **Yan Yao**, Air-free transfer vessel for multiple diagnostic tools, US Application, 18/341,051, 6/26/2023.
17. Ognjen Miljanic, **Yan Yao**, Said Jalife Jacobo, Judy Wu, Alexandra Robles, Cyclotetrabenzil material for lithium intercalation and use in organic batteries, US Application 18/216,410, 6/29/2023, UH 2023-051.
18. **Yan Yao**, Benjamin Emley, Chaoshan Wu, Zheng Fan, Lihong Zhao, All-solid-state lithium secondary battery and method of preparing the same, US Application 63/533,518, 8/18/2023, UH 2023-066.
19. **Yan Yao**, Lihong Zhao, Liqun Guo, All-solid-state lithium secondary battery and method of preparing the same, US Application 63/546,985, 11/2/2023, UH 2024-006.
20. Gangbing Song, Thomas Hannan, Jian Chen, **Yan Yao**, Method and system of monitoring cylindrical li-ion batteries using low-frequency stress-wave with machine-learning, 11/27/2023, UH 2024-022.

Presentations (180+ keynote and invited presentations)

(a) Plenary/Keynote Presentations

1. (Keynote) "Unveiling Lithium-Solid Electrolyte Interface Evolution in All-Solid-State Batteries through Operando Characterizations", Biannual International Conference on Energy Storage, Monterrey, Mexico, 11/16-17/2023.
2. (Plenary) "Organic Electrode Materials for Multivalent and Solid-state Batteries", Organic Battery Days 2023, Donostia-San Sebastian, Spain, 6/8/2023.
3. (Plenary) "Redox active polymers for beyond Li-ion batteries", International Conference on Functional Polymer Synthesis and Application, International Conference on Functional Polymer Synthesis and Application, Online, 12/9/2021.
4. (Keynote) "Organic electrode material design for beyond lithium ion batteries", 8th International Conference on Nanoscience & Technology (ChinaNANO 2019), Topical Session on Energy Nanotechnology, Beijing, China, 8/17-19/2019.
5. (Keynote) "Universal quinone electrode for long cycle life energy storage", Special Symposium in Honor of Michael Armand, ECS Fall Meeting, Cancun, Mexico, 10/2/2018.
6. (Keynote) "Versatile quinones for long cycle life aqueous batteries", First International Conference on Energy Storage Materials, Shenzhen, China, 11/19-21/2017

(b) Invited Presentations at U.S. and International Conferences

7. (Invited) “Organic electrode materials for multivalent and solid-state batteries”, 2024 Batteries Conference Gordon Research Conference, Ventura, CA, 2/25-3/1/2024, programmed.
8. (Invited) “Beyond Li-ion battery chemistries based on organic electrode materials”, The 13th Annual Battery Safety Summit, Tysons, VA, 11/6/2023.
9. (Invited) “Visualizing the evolution of lithium-solid electrolyte interface through operando characterizations in all-solid-state batteries”, LLNL Workshop on Electrochemical Interfaces: Integration Between Multiscale Modeling and Multimodal Characterization, Livermore, CA, 9/29/2023.
10. (Invited) “Analytical characterization for solid-state lithium batteries”, Clean Energy Forum 2023, San Diego, CA, 9/26/2023.
11. “Analysis of binder effects in dry and wet processed composite cathodes for all-solid-state lithium batteries”, Dry Coating Forum: shaping the future of dry battery electrode processing, Dresden, Germany, 9/13/2023.
12. “Understanding the role of mixed ionic-electronic conductor interlayer in all-solid-state lithium-metal batteries”, 74th Annual Meeting of the International Society of Electrochemistry, Lyon, France, 9/7/2023.
13. (Invited) “Understanding solid state electrolyte−lithium interfaces via operando characterizations”, FY23 Solid State Engineering Lab Review Meeting, Berkeley, CA, 8/30/2023.
14. (Invited) “Understanding the role of mixed ionic-electronic conductor interlayer in all-solid-state lithium-metal batteries”, Materials Challenges in Alternatives & Renewable Energy 2023 Meeting (MCARE 2023), Seattle, WA, 8/22/2023.
15. (Invited) “Understanding the role of mixed ionic-electronic conductor interlayer in all-solid-state lithium-metal batteries”, 243rd ECS Meeting, Boston, MA, 5/28/2023.
16. (Invited) “Lithium- and transition metal-free fast-charging batteries”, ARPA-E EVs4All Kick-off Meeting, Alexandria, VA, 5/9/2023.
17. (Invited) “Multidimensional characterizations for all-solid-state batteries”, MRS Fall Meeting, Boston, MA, 11/28/2022.
18. (Invited) “Lithium- and transition metal-free fast-charging batteries”, MRS Fall Meeting, Boston, MA, 11/28/2022.
19. (Invited) “Redox-active polymers for energy storage”, ACS Fall 2022 Meeting, Chicago, IL, 8/23/2022.
20. (Invited) “Understanding solid electrolyte-lithium interfaces via operando characterizations”, ACS Fall 2022 Meeting, Chicago, IL, 8/22/2022.
21. (Invited) “Rational design of high-power Mg batteries: from intercalation to conversion chemistry”, ACS Fall 2022 Meeting, Chicago, IL, 8/21/2022.
22. (Invited) “Multidimensional characterizations for all-solid-state batteries”, 2022 Molecular Foundry User Meeting, Berkeley, CA, 8/19/2022.
23. (Invited) “Understanding Solid Electrolyte-lithium Interfaces via Multiscale Characterizations”, Pittcon 2022, Online, 6/9/2022.
24. (Invited) “Advanced Characterizations of Interfaces in Solid-State Batteries”, 241st ECS Meeting, Vancouver, BC, Canada, 5/29-6/2/2022.
25. (Invited) “Understanding solid electrolyte-lithium interfaces via operando multiscale characterizations”, 2022 MRS Spring Meeting, Honolulu, HI, 5/8-11/2022.
26. (Invited) “Next-generation batteries for electric transportation and stationary energy storage”, IEEE NMDC 2021, Online, 12/12-15/2021.

27. (Invited) “Multidimensional diagnostics of solid-state lithium batteries”, 2021 MRS Fall Meeting, Boston, MA, 12/2/2021.
28. (Invited) “Rational design of multivalent metal batteries: enolization cathode and nonporous separator”, 2021 MRS Fall Meeting, Boston, MA, 11/30/2021.
29. (Invited) “Cobalt-free all-solid-state lithium batteries and air-free vessels for operando diagnosis”, Organic Battery Days 2021, Online, 11/25-28/2021.
30. (Invited) “Impact of electrolytes on cathode reaction mechanism in Mg batteries: from intercalation to enolization chemistry”, Mg Batteries and Key Materials Workshop, Online, 10/29-30/2021.
31. (Invited) “Cobalt-free all-solid-state lithium batteries and air-free vessels for operando diagnosis”, Nano Korea 2021, Online, 7/7-9/2021.
32. (Invited) “Multidimensional diagnostics of the interface evolutions in solid-state lithium batteries”, VTO Annual Merit Review, Online, 6/24/2021.
33. (Invited) “High-energy solid-state lithium batteries with organic cathode materials”, VTO Annual Merit Review, Online, 6/24/2021.
34. (Invited) “Rational design of high-power Mg batteries: from intercalation to enolization Chemistry”, Beyond Lithium-ion XIII Conference, Online, 6/9-11/2021.
35. (Invited) “Quinone-based organic materials for all-solid-state lithium batteries”, IUPAC-MACRO Conference, Online, 5/19/2021.
36. (Invited) “High-energy all-solid-state organic-lithium batteries”, 2021 Virtual MRS Spring Meeting, Online, 4/22/2021.
37. (Invited) “Beyond Li-ion battery chemistries based on organic electrode materials”, International Battery Seminar, Online, 3/9/2021.
38. (Invited) “High-energy all-solid-state organic-lithium batteries”, 2020 Virtual MRS Spring/Fall Meeting, Online, 12/1/2020.
39. (Invited) “Charge storage mechanism of a quinone polymer electrode for aqueous zinc-ion batteries”, 2020 Virtual MRS Spring/Fall Meeting, Online, 12/1/2020.
40. (Invited) NSF CBET Energy Storage Workshop, Austin, TX, 8/13/2020
41. (Invited) “Potential alternatives of lithium-ion batteries for the motive application”, NATTBATT 2020, Pasadena, CA, 2/13/2020.
42. (Invited) “Electrolyte dictated organic electrode materials design for energy storage”, MRS Fall Meeting, Boston, MA, 12/4/2019.
43. (Invited) “Electrolyte dictated organic electrode materials design for beyond lithium ion batteries”, ACS Meeting, San Diego, CA, 8/27/2019.
44. (Invited) “Developing all-solid-state batteries with organic electrode materials”, 5th International Conference on Energy Conversion and Storage (5th ICECS), Beijing, China, 8/15-16/2019.
45. (Invited) “Electrolyte dictated organic electrode materials design for beyond lithium ion batteries”, 10th International Conference on Materials for Advanced Technologies (ICMAT 2019), Singapore, 6/23-29/2019
46. (Invited) “Taming electrode-electrolyte interfaces using organic electrode materials in all -solid-state batteries”, International Conference on Solid State Ionics (SSI-22), PyeongChang, Korea 6/16-21/2019.
47. (Invited) “Directing Mg-Storage Chemistry in Organic Polymers Toward High-Energy Mg Batteries”,

ECS Meeting, Dallas, TX, 5/26-31/2019.

48. (Invited) "Long Cycle Life All-Solid-State Batteries using Organic Electrode Materials", Nature Conference on Emergent Materials and Devices: Electronic Structures and Properties, Chengdu, China, 4/12-14/2019.
49. (Invited) "Electrolyte dictated organic electrode materials design for beyond lithium ion batteries", International Coalition for Energy Storage and Innovation and Pacific Power Source and Pacific Power Sources Symposium Joint Meeting, Hawaii, 1/5-10/2019.
50. (Invited) "Versatile redox-active organic molecules for long cycle life safe batteries", MRS Fall Meeting, Boston, MA, 11/28/2018.
51. (Invited) "Positioning organic electrode materials in the battery landscape", 2018 International Photonics and Optoelectronics Meetings, Wuhan, China, 11/3/2018.
52. (Invited) "Versatile redox-active organic molecules for long cycle life safe batteries", *Symposium on Electrochemical Storage Materials and Devices*, AIChE Annual Conference, Pittsburgh, PA, 10/28/2018.
53. (Invited) "Progress of safe lithium ion batteries for electric vehicles", 2018 CAPA Petroleum Technical Symposium, Houston, TX, 10/19/2018.
54. (Invited) "Redox-active organic electrode materials for safe energy storage", Symposium *L05 Electroactive and Redox Active Polymers 2*, ECS Meeting, Cancun, Mexico, 10/2/2018.
55. (Invited) "High-energy solid-state lithium batteries with organic cathode materials", DOE Battery500 Review Meeting, San Francisco, CA, 8/1/2018.
56. (Invited) "Electrolyte Dictated Organic Redox Materials Design for Beyond Li Ion Batteries", Chinese Chemical Society Meeting, Hangzhou, China, 5/7/2018.
57. (Invited) "Electrolyte dictated materials design in beyond lithium-ion batteries", *Symposium on Energy Harvesting and Storage: Materials, Devices, and Applications VIII*, SPIE Defense and Commercial Sensing Conference, Orlando, FL, 4/16/2018
58. (Invited) "Universal aqueous energy storage with organic electrodes", *Symposium EN14 Materials Science and Device Engineering for Safe and Long-Life Electrochemical Energy Storage*, MRS Spring Meeting, Phoenix, AZ, 4/2/2018.
59. (Invited) "Versatile quinones for long cycle life aqueous batteries", First Annual Meeting of the International Coalition for Energy Storage and Innovation (ICESI), Dalian, China, 1/17-19/2018.
60. (Invited) "Versatile quinones for long cycle life aqueous batteries", Nature Conference on Materials Electrochemistry: Fundamentals & Applications, Shenzhen, China, 1/13-15/2018.
61. (Invited) "Versatile quinones for long cycle life aqueous batteries", 5th Advanced Batteries for xEV/ESS Conference, Shantou, Guangdong, China, 11/23-25/2017
62. (Invited) "Development of two-dimensional materials and quinones for rechargeable magnesium batteries", Beyond Lithium Ion-X Symposium on Energy Storage, IBM, Almaden, CA 6/27-29/2017
63. (Invited) "Design quinone electrodes for proton and metal ion storage with long cycle life", 3rd International Symposium on Energy Conversion and Storage, Nanjing University, Nanjing, China 6/24-25/2017
64. (Invited) "Design quinone electrodes for proton and metal ion storage with long cycle life", Organic Battery Days, Uppsala, Sweden 6/8-10/2017
65. (Invited) "Transforming two-dimensional materials for high capacity rechargeable magnesium

batteries", *Symposium H03 Properties and Applications of 2-Dimensional Layered Materials*, ECS Meeting, New Orleans, LA 5/2017

66. (Invited) "High Performance Magnesium Rechargeable Batteries", *Symposium ES3 Materials for Multivalent Electrochemical Energy Storage*, MRS Spring Meeting, Phoenix, AZ 4/17-21/2017
67. (Invited) "Organic Redox Materials for Stationary Energy Storage", *Symposium BM7 Functional Nanostructured Polymers for Emerging Energy Technologies*, MRS Fall Meeting, Boston, MA, 12/2016
68. (Invited) "A High Performance Magnesium Rechargeable Battery Enabled by a MgCl-ion Storage Mechanism", *Symposium ES1 Materials Science and Chemistry for Grid-Scale Energy Storage*, MRS Fall Meeting, Boston, 12/2016
69. (Invited) "Transforming two-dimensional materials for high capacity rechargeable magnesium batteries", *Organic Inorganic Hybrid Materials*, 2016 ACS Southwest Regional Meeting, Galveston, TX 11/2016
70. (Invited) "Redox-active organic materials for sustainable energy storage", *Colloidal & Surface Phenomena*, 2016 ACS Southwest Regional Meeting, Galveston, TX 11/2016
71. (Invited) "Research progress of rechargeable magnesium batteries", 11th International Forum on Li battery technology and industrial development, Hefei, Anhui, 10/2016
72. (Invited) "Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage" Energy & Sustainable Materials Symposium at the University of Oregon, 9/2016
73. (Invited) "Critical kinetic control of non-stoichiometric intermediate phase transformation for efficient perovskite solar cells", Symposium B7 *Solar Fuels/Artificial Photosynthesis: Materials and Devices*, XXV International Materials Research Congress, Cancun, Mexico, 8/14-19/2016
74. (Invited) "Rational Nanostructured Cathode Design for Rechargeable Magnesium Batteries", *Symposium B3 Materials and Technologies for Energy Conversion, Saving and Storage (MATECSS)*, XXV International Materials Research Congress, Cancun, Mexico, 8/14-19/2016
75. (Invited) "Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage", Chinese Chemical Society Annual Conference, Dalian, China, 7/1-4/2016.
76. (Invited) "Organic Redox Materials for Stationary Energy Storage", International Conference of Synthetic Metal 2016, Guangzhou, China, 6/26-30/2016
77. (Invited) "Organic Redox Materials for Stationary Energy Storage", 11th US-China Nano Forum, Nanjing, China, 6/18-20/2016
78. (Invited) "Transforming Two-dimensional Transition Metal Chalcogenides for High Capacity Rechargeable Magnesium Batteries", Nature Conference on Materials for Energy 2016, Wuhan, China, 6/11-14/2016
79. (Invited Panelist) 2016 US China Innovation and Investment Summit, Houston, TX, 5/17/2016.
80. (Invited) "Heavily n-Dopable π-Conjugated Redox Polymers for Ultrafast Energy Storage", Symposium *ACS Award for Creative Invention: Symposium in honor of Antonio Facchetti*, ACS Meeting, San Diego, 3/14/2016
81. (Invited) "Rational Nanostructure Design for High Performance Mg Rechargeable Batteries", *Interplay of Structure & Transport Properties in Materials for Energy Applications*, ACS Meeting, San Diego, 3/16/2016
82. (Invited) "Modification of Magnesium Ion Cathode and Electrolyte for Mg Rechargeable Batteries", TMS Meeting, Orlando, FL, USA, 3/16/2015.

83. (Invited) "Advanced Aqueous Lithium Ion Batteries using Organic Materials", ARPA-E Program Review Meeting, Tempe, AZ, 1/28/2015.

84. (Invited) "Atomic-Level Manipulation of Magnesium Ion Intercalation Materials for High-Density Energy Storage", 2014 Electrochemical Conference on Energy & Environment, Shanghai, China, 3/13/2014.

85. (Invited) "Nanostructure Engineering of Layered Metal Chalcogenides for Magnesium Battery Cathode", TMS Meeting, San Diego, CA, USA, 2/20/2014.

86. (Invited) "High Energy Density Silicon Anodes for Lithium-ion Batteries: Combining Hollow Nanospheres with Conductive Polymer Binder", 245th ACS National Meeting, *Division of Energy and Fuels*, New Orleans, LA, 4/7-11/2013.

87. (Invited) "Nanostructure Design for Efficient Energy Devices", Workshop on Materials Science and Materials Chemistry for Energy, Beijing, China, 9/16-18/2012.

88. (Invited) "Nanostructured Materials and Devices for Energy Harvesting and Storage", Master Lecture in Printed Electronics, San Jose, CA, 12/2011.

(c) University and Industry Seminars

89. (Invited) "Organic Electrode Materials for Multivalent and Solid-state Batteries", Dresden University of Technology, Dresden, Germany, 9/12/2023.

90. (Invited) "Visualizing Lithium-Solid Electrolyte Interface Evolution via Operando Characterizations in All-solid-state Batteries", Factorial Energy, Woburn, MA, 5/30/2023.

91. (Invited) "Visualizing Lithium-Solid Electrolyte Interface Evolution via Operando Characterizations in All-solid-state Batteries", Lyten Corporation, San Jose, CA, 4/12/2023.

92. (Invited) "Visualizing Lithium-Solid Electrolyte Interface Evolution via Operando Characterizations in All-solid-state Batteries", Prof. Yi Cui's group, Stanford University, Stanford, CA, 4/11/2023.

93. (Invited) "Next-Generation Batteries for Electric Vehicles and Grid Energy Storage", Department of Chemical Engineering, Imperial College London, London, UK, 1/27/2023.

94. (Invited) "The Key Challenges for Lithium-metal-based All-Solid-State Batteries", AMOLF, Amsterdam, Netherland, 1/26/2023.

95. (Invited) "Multidimensional Characterizations for All-Solid-State Batteries", Ford Motors, Virtual, 10/18/2022.

96. (Invited) "Next-generation batteries for electric vehicles and stationary storage", Department of Industrial and Systems Engineering Seminar, Hong Kong Polytechnic University, Virtual, 9/15/2022.

97. (Invited) "Next-generation batteries for electric vehicles and stationary storage", Materials Science and Engineering Department Seminar, UCLA, Los Angeles, CA, 4/15/2022.

98. (Invited) "Next-generation batteries for electric vehicles and stationary storage", Chemistry and Biochemistry Department Biochemistry Divisional Seminar, Ohio State University, Columbus, OH 4/6/2022.

99. (Invited) "Next-generation batteries for electric vehicles and stationary storage", Materials Science and Engineering/Applied Physics, KAUST, online, 3/31/2022.

100. (Invited) "Next-generation batteries for electric vehicles and stationary storage", Mechanical Science and Engineering, University of Illinois Urbana-Champaign, Urbana, IL, 3/29/2022.

101. (Invited) "Next-generation batteries for electric vehicles and stationary storage", Giner Inc., Online, 3/9/2022.

102. (Invited) “Next-generation batteries for electric vehicles and stationary storage”, Chemistry and Biochemistry Department Seminar, George Mason University, Online, 2/11/2022.
103. (Invited) “Multiscale characterizations for solid-state lithium batteries”, Solid-state battery colloquium, Argonne National Laboratory, Online, 1/26/2022.
104. (Invited) “Next-generation batteries for electric vehicles and stationary storage”, Materials Science and Engineering, University of Texas Arlington, Online, 10/21/2021.
105. (Invited) “Next-generation batteries for electric vehicles and stationary storage”, Materials Science and Engineering, Iowa State University, Online, 10/4/2021.
106. (Invited) “Next-generation batteries for electric vehicles and stationary storage”, Lindsay Seminar of Chemical Engineering, Texas A&M University, In person, 9/29/2021.
107. (Invited) “All-solid-state lithium batteries: materials, processing and diagnosis”, SLAC Photon Science Seminar, Online, 4/20/2021.
108. (Invited) “Cobalt-free solid-state lithium batteries”, Nissan North America Battery Group, Online, 3/25/2021.
109. (Invited) “Next-generation batteries for electric vehicles and stationary storage”, ECS Webinar, Online, 2/24/2021.
110. (Invited) “Organic electrode materials design for emerging rechargeable batteries”, Yonsei University Department of Chemical Engineering, Online, 1/18/2021.
111. (Invited) “Next-generation batteries for electric vehicles and stationary storage”, University of Freiburg, Germany, Online, 1/13/2021.
112. (Invited) “Next-generation batteries for electric vehicles and stationary storage”, Mexican Energy Storage Network Webinar Series, Online, 12/11/2020.
113. (Invited) “Next-generation batteries for electric vehicles and stationary storage”, UH Energy Webinar Series, Online, 12/8/2020.
114. (Invited) “Next-generation batteries for electric vehicles and stationary storage”, UH ECE Luncheon, Online, 10/14/2020.
115. (Invited) “Electrolyte dictated organic electrode materials design for beyond lithium ion batteries”, City University at New York Energy Institute, New York, NY, 11/25/2019.
116. (Invited) “Electrolyte dictated organic electrode materials design for beyond lithium ion batteries”, Shell Technology Center Houston, Houston, TX, 11/21/2019.
117. (Invited) “Electrolyte dictated organic electrode materials design for beyond lithium ion batteries”, Department of Chemistry, Binghamton University, Binghamton, NY, 11/1/2019.
118. (Invited) “Electrolyte dictated organic electrode materials design for beyond lithium ion batteries”, Department of Materials Science and NanoEngineering, Rice University, Houston, TX, 10/10/2019.
119. (Invited) “Electrolyte dictated organic electrode materials design for beyond lithium ion batteries”, Energy Storage and Membrane Materials Group, Oak Ridge National Laboratory, Oak Ridge, TN, 10/3/2019.
120. (Invited) “Electrolyte dictated organic electrode materials design for beyond lithium ion batteries”, Institute of Physics Chinese Academy of Sciences, Beijing, China, 8/21/2019.
121. (Invited) “Electrolyte dictated organic electrode materials design for beyond lithium ion batteries”, College of Materials and Engineering, University of Chinese Academy of Sciences, Beijing, China, 8/20/2019.

122. (Invited) “Developing all-solid-state batteries with organic electrode materials”, Hanyang University, Seoul, Korea, 6/17/2019.
123. (Invited) “Positioning organic electrode materials in the battery landscape”, Institut des Maerlaux Jean Rouxel, CNRS, Nantes, France, 11/7/2018
124. (Invited) “Positioning organic electrode materials in the battery landscape”, Texas Center for Superconductivity, Houston, TX, 10/18/2018
125. (Invited) “Versatile organic electrode materials for long life safe batteries”, College of Materials Science and Engineering, University of Science and Technology Beijing, Beijing, China 6/12/2018
126. (Invited) “Versatile organic electrode materials for long life safe batteries”, Energy Processes & Materials Division, Pacific Northwest National Lab, 6/7/2018
127. (Invited) “Versatile organic electrode materials for long life safe batteries”, SABIC, Sugar Land, Texas 6/5/2018
128. (Invited) “Electrolyte dictated materials design for beyond lithium ion batteries”, Shenzhen Institutes of Advanced Technology Chinese Academy of Sciences, Shenzhen, China, 5/11/2018
129. (Invited) “Electrolyte dictated materials design for beyond lithium ion batteries”, College of Materials Science and Engineering, Zhejiang University of Technology, Hangzhou, China 5/9/2018
130. (Invited) “Versatile organic electrode materials for long life safe batteries”, Ningbo Material Technology and Engineering Institute, Ningbo, China, 5/8/2018
131. (Invited) “Versatile organic electrode materials for long life safe batteries”, College of Chemical and Biomolecular Engineering, Zhejiang University, Hangzhou, China, 5/7/2018
132. (Invited) “Versatile organic electrode materials for long life safe batteries”, Department of Materials Science and Engineering, University of California Los Angeles, 4/13/2018
133. (Invited) “Electrolyte dictated materials design for beyond lithium-ion batteries”, Department of Nanoengineering, University of California San Diego, 4/11/2018
134. (Invited) “Electrolyte dictated materials design for beyond lithium-ion batteries”, Department of Materials Science and Engineering, Iowa State University, 2/22/2018
135. (Invited) “Electrolyte dictated materials design for beyond lithium-ion batteries”, Department of Applied Physics & Applied Mathematics, Columbia University, 12/1/2017
136. (Invited) “Electrolyte dictated materials design for beyond lithium-ion batteries”, Department of Materials Science and Engineering, Fudan University, 11/18/2017
137. (Invited) “Electrolyte dictated materials design for beyond lithium-ion batteries”, Center for Advanced Computing and Data Systems, University of Houston, 11/9/2017
138. (Invited) “Electrolyte dictated materials design for beyond lithium-ion batteries”, Department of Materials Science and Engineering, Texas A&M University, 10/23/2017
139. (Invited) “Materials design for beyond lithium-ion batteries”, Department of Mechanical and Aerospace Engineering, West Virginia University, 9/8/2017
140. (Invited) “Two-Dimensional Materials and Organic Redox Materials for Mg Rechargeable Batteries”, School of Materials Science and Engineering, Nanjing University of Posts and Telecomm, 6/26/2017
141. (Invited) “Two-Dimensional Materials and Organic Redox Materials for Mg Rechargeable Batteries”, School of Energy, Beijing University of Chemical Technology, 6/21/2017
142. (Invited) “Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-

Cost Energy Storage", School of Materials Science and Engineering, South University of Science and Technology, 1/6/2017

143. (Invited) "Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage", School of Chemical Engineering, Nantong University, 12/30/2016
144. (Invited) "Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage", Department of Chemical Engineering and Material Science, Michigan State University, 10/27/2016
145. (Invited) "Two-Dimensional Materials and Redox-Active Organic Materials for Sustainable Stationary Energy Storage", School of Materials Science and Engineering, Tsinghua University, Beijing, China, 7/7/2016
146. (Invited) "Two-Dimensional Materials and Redox-Active Organic Materials for Sustainable Stationary Energy Storage", Institute of Applied Chemistry and Engineering, Nankai University, Tianjing, China, 7/5/2016
147. (Invited) "Two-Dimensional Materials and Redox-Active Organic Materials for Sustainable Stationary Energy Storage", Institute of Fundamental and Frontier Sciences, University of Electronic Science and Technology of China, Chengdu, China, 6/23/2016
148. (Invited) "Two-Dimensional Materials and Redox-Active Organic Materials for Sustainable Stationary Energy Storage", School of Materials Science and Engineering, Nanjing University of Science and Technology, Nanjing, China, 6/20/2016
149. (Invited) "Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage", Department of Chemical and Biochemical Engineering, University of Houston, Houston, TX 4/29/2016
150. (Invited) "Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage", Department of Electrical and Computer Engineering, Texas Tech University, Lubbock, TX, 4/1/2016
151. (Invited) "Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage", Department of Materials and NanoEngineering, Rice University, Houston, TX, 3/24/2016
152. (Invited) "Low-Cost and Safe Magnesium Batteries", Tianqi Lithium Industries Co., Sichuan, China 7/6/2015.
153. (Invited) "Interlayer-Expanded Molybdenum Disulfide Nanocomposites for Electrochemical Magnesium Storage", Florida International University, Miami, FL 3/21/2015
154. (Invited) "Modification of Magnesium Ion Cathode and Electrolyte for Mg Rechargeable Batteries", Department of Sustainable Energy Technologies, Brookhaven National Laboratory, Upton, NY 6/13/2014
155. (Invited) "Recent Development of Magnesium Rechargeable Batteries", School of Materials Science and Engineering, Wuhan Institute of Technology, Wuhan, China 3/10/2014
156. (Invited) "Advanced Aqueous Lithium Ion Batteries using Organic Materials", ARPA-E RANGE Kick-off Meeting, Kennedy Space Center, Cape Canaveral, FL, 1/28/2014.
157. (Invited) "Rational Nanostructure Design for High Energy Density Batteries", South University of Science and Technology of China, Shenzhen, China 12/13/2013.
158. (Invited) "Rational Nanostructure Design for High Energy Density Batteries", Department of Electrical Engineering, Tsinghua University, Beijing, China 9/17/2013.

159. (Invited) “Rational Nanostructure Design for High Energy Density Batteries”, Department of Environmental Engineering, University of Shanghai for Science and Technology, Shanghai, China, 9/10/2013.

160. (Invited) “Nanostructure Design for Efficient Energy Devices”, Schlumberger Sugar Land Technology Center, Sugar Land, TX, 5/9/2013.

161. (Invited) “Nanostructure Design for Efficient Energy Devices”, Southwest Research Institute, San Antonio, TX, 3/13/2013.

162. (Invited) “Rational Nanostructure Design for High Energy Density Batteries”, Baylor College of Medicine, Houston, TX 3/4/2013.

163. (Invited) “Rational Nanostructure Design for High Energy Density Batteries”, Department of Mechanical Engineering, University of Houston, Houston, TX, 1/17/2013.

164. (Invited) “Rational Nanostructure Design for High Energy Density Batteries”, School of Materials Science and Engineering, Beijing University of Technology, Beijing, 9/19/2012.

165. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Mechanical Engineering, Yale University, New Haven, CT 5/2/2012.

166. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Materials Science and Engineering, University of Virginia, Charlottesville, VA 4/30/2012.

167. (Invited) “Nanostructure Design for Efficient Energy Devices”, College of Engineering, Dartmouth College, Hanover, NH 4/26/2012.

168. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Mechanical Engineering, University of Washington, Seattle, WA 4/16/2012.

169. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Materials Science and Engineering, University of Wisconsin Madison, Madison, WI 4/5/2012.

170. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Electrical and Computer Engineering, University of Houston, Houston, TX 4/2/2012.

171. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Mechanical and Automation Engineering, Chinese University of Hong Kong, Hong Kang, 3/27/2012.

172. (Invited) “Nanostructure Design for Efficient Energy Devices”, Suzhou Institute of Nanotechnology, Suzhou, China 3/23/2012.

173. (Invited) “Nanostructure Design for Efficient Energy Devices”, School of Engineering, Nanjing University, Nanjing, China 3/21/2012.

174. (Invited) “Nanostructure Design for Efficient Energy Devices”, Frontier Institute of Science and Technology, Xi’an Jiaotong University, Xi’an, China 3/19/2012.

175. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Mechanical Engineering, EPFL, Lausanne, Switzerland 3/8/2012.

176. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Mechanical Engineering, Johns Hopkins University, Baltimore, MD 2/16/2012.

177. (Invited) “Nanostructure Design for Efficient Energy Devices”, Institute of Materials Research and Engineering, Singapore, 2/3/2012.

178. (Invited) “Nanostructure Design for Efficient Energy Devices”, Nanyang Technology University, Singapore, 2/1/2012.

179. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Mechanical Engineering, University of Texas San Antonio, San Antonio, TX 1/26/2012.

180. (Invited) “Nanostructure Design for Efficient Energy Devices”, Department of Materials Science and Engineering, Drexel University, Philadelphia, PA12/13/2011.

181. (Invited) “Nanostructured Energy Devices: Polymer Solar Cells and Lithium Ion Batteries”, Institute of Chemistry of Chinese Academy of Sciences, China, 9/2011.

182. (Invited) “Nanostructured Energy Devices: Polymer Solar Cells and Lithium Ion Batteries”, Department of Materials Science, Fudan University, Shanghai, China, 9/2011.