

Wan-Yu Tsai

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Ten years of experience in characterizing materials for supercapacitor and battery applications; Expert in development and implementation of in-situ electrochemical techniques (EQCM and AFM) to probe electrode/electrolyte interfacial properties

Area of research

- Characterize solid/solid and solid/liquid interface by combining in-situ AFM and other techniques
- Understand electro-chemo-mechanical coupling behaviors of energy storage materials
- Visualize ionic liquid electric double layer (EDL) structure at electrode /electrolyte interface

EXPERIENCE

2020–present	Research Associate	Oak Ridge National Laboratory, USA
2017–2019	Postdoctoral researcher	Oak Ridge National Laboratory, USA
2015–2016	Postdoctoral researcher	Paul Sabatier University, France
2012–2015	Doctoral student	Paul Sabatier University, France

EDUCATION

Ph.D.	2015	Materials Science	Paul Sabatier University, France
M.S.	2011	Materials for Energy Storage and Conversion	Marseille, Amiens & Toulouse, France ; Warsaw, Poland; Cordoba, Spain
B.S.	2008	Materials Science and Engineering	National Tsing Hua University, Taiwan

PUBLICATIONS

- (1) Ritu Sahore, Guang Yang, Xi Chelsea Chen, Wan-Yu Tsai, Jianlin Li, Nancy J. Dudney, and Andrew Westover “A Bilayer Electrolyte Design to Enable High-Areal-Capacity Composite Cathodes in Polymer Electrolytes Based Solid-State Lithium Metal Batteries”, **ACS Appl. Energy Mater.** 5, 1409–1413 (2022)
- (2) Mehrnaz Mojtavavi, Wan-Yu Tsai, Armin Vahid Mohammadi, Teng Zhang, Yury Gogotsi, Nina Balke, and Meni Wanunu, “Ionically Active MXene Nanopore Actuators” **Small**, 18, 2105857 (2022)
- (3) Sergiy Kalnaus, Ruhul Amin, Chad Parish, Anand Parejiya, Rachid Essehli, Andrew Westover, Wan-Yu Tsai, Jagjit Nanda, and Ilias Belharoua “Effect of Composition on Mechanical Properties and Conductivity of the Dual-Ion Conductor $\text{Na}^{1+x}\text{Mn}_x/2\text{Zr}_{2-x}/2(\text{PO}_4)_3$ for Solid-State Batteries” **ACS Appl. Energy Mater.**, 4, 11684–11692 (2021)
- (4) Xuehang Wang, Tyler S. Mathis, Yangyunli Sun, Wan-Yu Tsai, Netanel Shpigel, Hui Shao, Danzhen Zhang, Kanit Hantanasirisakul, Fyodor Malchik, Nina Balke, De-en Jiang, Patrice Simon, and Yury Gogotsi “Titanium Carbide MXene Shows an Electrochemical Anomaly in Water-in-Salt Electrolytes” **ACS Nano**, 15, 15274–15284 (2021)
- (5) Shelby Boyd, Karthik Ganeshan, Wan-Yu Tsai, Tao Wu, Saeed Saeed, De-en Jiang, Nina Balke, Adri C. T. van Duin and Veronica Augustyn “Effects of interlayer confinement and hydration on capacitive charge storage in birnessite” **Nat. Mater.**, 20, 1689–1694 (2021)
- (6) Wan-Yu Tsai, Thomas Thundat, and Jagjit Nanda “Toward a mechanically stable solid electrolyte interphase” **Matter**, 4, 2100–2122, July 7 (2021)
- (7) Saeed Saeed, Shelby Boyd, Wan-Yu Tsai, Ruocun Wang, Nina Balke and Veronica Augustyn “Understanding

- electrochemical cation insertion into prussian blue from electrode deformation and mass changes” **Chem. Commun.**, 57, 6744-6747 (2021)
- (8) Qiang Gao, Wan-Yu Tsai, Nina Balke, "In situ and Operando Force-based Atomic Force Microscopy For Probing Local Functionality in Energy Storage Materials" **Electrochem. Sci. Adv.**, e2100038 (2021)
- (9) Bishnu P. Thapaliya, Huimin Luo, Mengya Li, Wan-Yu Tsai, Harry M. Meyer III, John R. Dunlap, Jagjit Nanda, Ilias Belharouak and Sheng Dai, “Molten Salt Assisted Low-Temperature Electro-Catalytic Graphitization of Coal Chars” **J. Electrochem. Soc.**, 168, 046504 (2021)
- (10) Wan-Yu Tsai, Ruocun Wang, Shelby Boyd, Veronica Augustyn and Nina Balke, "Probing local electrochemistry via mechanical cyclic voltammetry curves" **Nano Energy**, 81, 105592 (2021)
- (11) Mengya Li, Wan-Yu Tsai, Bishnu P. Thapaliya, Harry M. Meyer III, Beth L. Armstrong, Huimin Luo, Sheng Dai, Jagjit Nanda and Ilias Belharouak, "Modified coal char materials with high rate performance for battery applications" **Carbon**, 172, 414-421 (2021)
- (12) Ivana Hasa, Atetegeb M. Haregewoin, Liang Zhang, Wan-Yu Tsai, Jinghua Guo, Gabriel M. Veith, Philip N. Ross, and Robert Kostecky, "Electrochemical Reactivity and Passivation of Silicon Thin-Film Electrodes in Organic Carbonate Electrolytes" **ACS Appl. Mater. Interfaces.**, 12, 40879-40890 (2020)
- (13) Qiang Gao, Weiwei Sun, Poorandokht Ilani-Kashkouli, Alexander Tselev, Paul Kent, Nadine Kabengi, Michael Naguib, Mohamed Alhabeab, Wan-Yu Tsai, Arthur P. Baddorf, Jingsong Huang, Stephen Jesse, Yury Gogotsi, and Nina Balke, “Tracking ion intercalation into layered Ti₃C₂ MXene films across length scales” **Energy Environ. Sci.**, (2020)
- (14) Martin S. Barbosa, Nina Balke, Wan-Yu Tsai, Clara Santato, and Marcelo O. Orlandi, "On the Structure of the Electrical Double Layer at the Interface between an Ionic Liquid and Tungsten Oxide in Ion-gated Transistors" **J. Phys. Chem. Lett.**, 11, 9, 3257–3262 (2020)
- (15) Nikolay Borodinov, Wan-Yu Tsai, Vladimir V. Korolkov, Nina Balke, Sergei V. Kalinin, and Olga S. Ovchinnikova. “Machine learning-based multidomain processing for texture-based image segmentation and analysis” **Appl. Phys. Lett.**, 116, 044103 (2020)
- (16) Marm B. Dixit, Wahid Zaman, Nicholas Hortance, Stella Vujic, Brice Harkey, Fengyu Shen, Wan-Yu Tsai, Vincent De Andrade, X. Chelsea Chen, Nina Balke, and Kelsey B. Hatzel. “Nanoscale Mapping of Extrinsic Interfaces in Hybrid Solid Electrolytes” **Joule**, 4, 1, 207-211 (2020)
- (17) Sergei V. Kalinin, Ondrej Dyck, Nina Balke, Sabine Neumayer, Wan-Yu Tsai, Rama Vasudevan, David Lingerfelt, Mahshid Ahmadi, Maxim Ziatdinov, Matthew T. McDowell, and Evgheni Strelcov. “Toward Electrochemical Studies on the Nanometer and Atomic Scales: Progress, Challenges, and Opportunities” **ACS Nano**, 13, 9, 9735-9780 (2019)
- (18) Wan-Yu Tsai, Jeremy Come, Wei Zhao, Runxi Wang, Guang Feng, Bishnu Prasad Thapaliya, Sheng Dai, Liam Collins, and Nina Balke. “Hysteretic Order-disorder Transitions of Ionic Liquid Double Layer Structure on Graphite” **Nano Energy**, 60, 886-894 (2019)
- (19) Daniel Moreno, Yousuf Bootwala, Wan-Yu Tsai, Qiang Gao, Fengyu Shen, Nina Balke, Kelsey B. Hatzell, Marta C. Hatzell, “In Situ Electrochemical Dilatometry of Phosphate Anion Electrosorption” **Environ. Sci. Technol. Lett.**, 5, 12, 745-749 (2018)
- (20) Ruocun Wang, James B. Mitchell, Qiang Gao, Wan-Yu Tsai, Shelby Boyd, Matt Pharr, Nina Balke, Veronica

- Augustyn, “Operando Atomic Force Microscopy Reveals Mechanics of Structural Water Driven Battery-to-Pseudocapacitor Transition” **ACS Nano**, 12, 6, 6032-6039 (2018)
- (21) Edurne Redondo, Wan-Yu Tsai, Barbara Daffos, Pierre-Louis Taberna, Patrice Simon, Eider Goikolea, Roman Mysyk, “Outstanding Room-Temperature Capacitance of Biomass-Derived Microporous Carbons in Ionic Liquid Electrolyte” **Electrochemistry Communications**, 79, 5-8, (2017)
- (22) John M. Griffin, Alexander C. Forse, Wan-Yu Tsai, Pierre-Louis Taberna, Patrice Simon, Clare P. Grey, “In Situ NMR Spectroscopy Combined with Electrochemical Quartz Crystal Microbalance Measurements Reveal the Structure of the Electric Double-Layer in Supercapacitor Electrodes” **Nature Materials**, 14 (8), 812-819, (2015)
- (23) Peng-Cheng Gao, Wan-Yu Tsai, Barbara Daffos, Pierre-Louis Taberna, Carlos R. Pérez, Yury Gogotsi, Patrice Simon, Frédéric Favier, “Graphene-like carbide derived carbon for high-power supercapacitors” **Nano Energy**, 12, 197-206, (2015)
- (24) Wan-Yu Tsai, Pierre-Louis Taberna, Patrice Simon, “Electrochemical Quartz Crystal Microbalance (EQCM) Study of Ion Dynamics in Nanoporous Carbons” **Journal of American Chemical Society**, 136, 8722-8728, (2014)
- (25) Wan-Yu Tsai, Peng-Cheng Gao, Barbara Daffos, Pierre-Louis Taberna, Carlos R Perez, Yury Gogotsi, Frederic Favier, Patrice Simon, “Ordered mesoporous silicon carbide-derived carbon for high-power supercapacitors” **Electrochemistry Communications**, 34, 109-112 (2013)
- (26) Wan-Yu Tsai, Rongying Lin, Shanthi Murali, Li Li Zhang, John K McDonough, Rodney S Ruoff, Pierre-Louis Taberna, Yury Gogotsi, Patrice Simon, “Outstanding performance of activated graphene-based supercapacitors in ionic liquid electrolyte from -50 to 80°C ”, **Nano Energy**, 2 (3), 403-411 (2013)
- (27) Chung-Min Tsai, Guo-Dung Chen, Tzu-Chun Tseng, Chung-Yang Lee, Chi-Te Huang, Wan-Yu Tsai, Wei-Chang Yang, Ming-Shih Yeh, Tri-Rung Yew, “CuO nanowire synthesis catalyzed by a CoWP nanofilter”, **Acta Materialia**, 57, 1570-1576 (2009)

PROFESSIONAL ACTIVITIES

- Invited talk:
 - 2021** Beyond Li Ion XIII Symposium (Virtual), Argonne National Laboratory, USA
 - 2019** International Symposium on Enhanced Electrochemical Capacitors, Nantes, France
 - 2018** ACS National Meeting, Boston USA
MRS Spring Meeting & Exhibit, Phoenix, USA
 - 2017** XXVI International Materials Research Congress, Cancun, Mexico
 - 2016** International Conference on Advanced Capacitors, Otsu, Japan
- Peer reviewer for *Progress in Materials Science*, *ACS Nano*, *Nano Letter*, *The Electrochemical Society Journals*, *Electrochemistry Communications*, *Sensors*, *Molecules*, *Nature Communications*
- Co-organized 68th Canadian Chemical Engineering Conference (2018)
- Participated and assisted CNMS User Program for in-situ electrochemical AFM user projects
- Participate in CNMS Pycroscopy (Python package for spectroscopy data processing) Workshop 2018