

IGNITE 2024

Inspiring **G**enerations of **N**ew Innovators to **I**mpact Technologies in **E**nergy 2024

SELECTEE DESCRIPTIONS



Jessica Boles

University of California, Berkeley – Berkeley, CA

Jessica Boles is an assistant professor in electrical engineering at the University of California, Berkeley, and co-director of the recently launched Berkeley Power and Energy Center. Boles will explore a new class of power electronics based on modular piezoelectric components, which are capable of enabling order-of-magnitude scale miniaturization and significant gains in efficiency for power electronics in a wide variety of applications.

Project: High-Performance, Modular Piezoelectric Components for Miniaturized Power Conversion – Award Amount: \$500,000



Craig Cahillane

Syracuse University – Syracuse, NY

Craig Cahillane is an assistant professor at Syracuse University with a background in gravitational wave detection. In this project, Cahillane will build a novel prototype for neutral beam injection in fusion reactors. The work will support the development of electricity generation and storage for enabling fusion power generation and new advancements in lasers and materials technologies.

Project: Ultra-High Power Photoneutralization Cavity for Neutral Beam Injection in Fusion Reactors – Award Amount: \$500,000



Liang Feng

Duke University – Durham, NC

Liang Feng is an assistant professor at Duke University in mechanical engineering and materials science. Feng is developing a process to convert plastic waste, such as plastic bottles and bags, into adsorbents to capture carbon dioxide. The approach seeks to take advantage of the tough and long-lasting nature of plastics to create carbon-dioxide sponges with high porosity and durability.

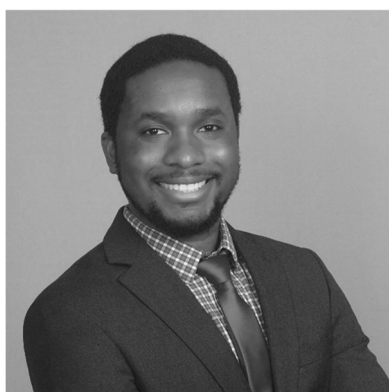
Project: Upgrading Plastic Waste into Low-Cost Porous Adsorbents for Direct Air Capture – Award Amount: \$500,000


Fudong Han

Rensselaer Polytechnic Institute – Troy, NY

Fudong Han currently holds the Priti and Mukesh Chatter '82 Career Development Chair Assistant Professorship at Rensselaer Polytechnic Institute. Han aims to develop a low-cost solid-state battery that enables cleaner, safer, and more efficient electric aircraft. This project leverages Han's recent discovery utilizing halide-based solid electrolytes.

Project: Critical Metal-Free, Conversion-Type Solid-State Batteries for Advanced Air Mobility – Award Amount: \$500,000


Nelson James

National Renewable Energy Laboratory – Golden, CO

Nelson James is a researcher in the National Renewable Energy Laboratory's advanced building equipment research group. James will develop a proof-of-concept prototype of a multifunctional heat pump to reduce building heating and cooling emissions and improve building energy resilience. This will be accomplished through new compression approaches and system designs.

Project: Electrochemically Looping Adsorptive Heat Pumps for Next-Generation Building Decarbonization – Award Amount: \$499,922


Katrina Knauer

National Renewable Energy Laboratory – Golden, CO

Katrina (Kat) Knauer is a researcher at the National Renewable Energy Laboratory, the CTO of the BOTTLE Consortium, and an assistant adjunct professor at the University of Colorado, Boulder. Knauer will focus on a new process for mixed, variable bio-based polyester waste streams based on a volatile amine catalyzed methanolysis process. This technology will reduce reliance on both fossil fuels and agricultural feedstocks.

Project: Mixed Polyester Deconstruction & Monomer Recovery to Enable a Circular Bioeconomy – Award Amount: \$499,999


Sebastian Kube

University of Wisconsin–Madison – Madison, WI

Sebastian Kube is an assistant professor in materials science and engineering at the University of Wisconsin–Madison. The objective of Kube's project is to build an autonomous laboratory platform, "AlloyBot," which will develop new structural alloys for energy and propulsion technologies. AlloyBot will synthesize and test 100 new alloy compositions per week with minimal human assistance.

Project: AlloyBot: Autonomous Platform to Develop Alloys for Energy and Propulsion Technologies 100x Faster – Award Amount: \$500,000



Woongkul Lee

Michigan State University – East Lansing, MI

Woongkul Lee is an assistant professor in electrical and computer engineering at Michigan State University. The objective of Lee's research is to develop an optically powered ultra-high-speed wound-field synchronous generator for uncrewed aircraft. The generator will be integrated with an optical encoder for position estimation to maximize its power density, reliability, and power handling capability.

Project: Optically Powered Ultra-high-Speed (OPUS) Wound-Field Synchronous Generators – Award Amount: \$500,000



Jinxing Li

Michigan State University – East Lansing, MI

Jinxing Li is an assistant professor in the Department of Biomedical Engineering and the Institute for Quantitative Health Science and Engineering at Michigan State University. In this project, Li aims to reduce carbon emissions associated with both building materials and construction methods through 3D robotic bioprinting of biogenic concrete structures to create next-generation sustainable and intelligent buildings.

Project: Robotic 3D Bioprinting of Entire Building Structures Using Biogenic Concrete – Award Amount: \$500,000



Rain Mariano

Peregrine Hydrogen – Santa Cruz, CA

Rain (Ruperto) Mariano is Director of Cell Development at Peregrine Hydrogen, focused on delivering green hydrogen without the premium. Mariano's objective is to develop an electrolysis technology to provide affordable hydrogen by cutting the energy intensity of water electrolysis in half. If successful, the technology has the potential to decarbonize highly polluting hydrogen used in industry today by providing a cost-competitive alternative.

Project: Advanced Electrolysis Architectures for Low-Cost Green Hydrogen – Award Amount: \$500,000



Luca Mastropasqua

University of Wisconsin–Madison – Madison, WI

Luca Mastropasqua is an assistant professor in mechanical engineering at the University of Wisconsin-Madison. Mastropasqua seeks to transform the waste plastic upcycling process by studying, developing, and characterizing an innovative solid-state electrochemical membrane reactor and its thermal integration. This will be achieved through high-temperature electrochemical hydrogenative depolymerization of long amorphous and semi-crystalline polymers.

Project: Direct High-Temperature Electrochemical Hydrogenative Depolymerization for Waste Plastic Upcycling – Award Amount: \$500,000


Paul Meyer

National Renewable Energy Laboratory – Golden, CO

Paul Meyer is a researcher at the National Renewable Energy Laboratory. In this project, Meyer seeks to develop a lignin-based concrete alternative for buildings and construction to address major challenges facing this industrial sector. The project will explore different types of lignin, the effects on chemical reactions and drying times, and pathways to large-scale commercialization.

Project: BUILD'EM: Chemistry, Performance, and Path to Market of a Cement-less Construction Material – Award Amount: \$499,989


Justin Panich

Lawrence Berkeley National Laboratory – Berkeley, CA

Justin Panich leads a research group at Lawrence Berkeley National Laboratory and is a deputy director at the Joint BioEnergy Institute. In this project, Panich will develop a bioelectrocatalytic cell that converts renewable energy, carbon dioxide, and nitrogen gas into ammonia. The team will maximize microbes for ammonia production through bioengineering strategies and integrate the microbes into an electrolysis-coupled growth chamber.

Project: Carbon-Negative and Ambient Production of Fertilizer Precursor – Award Amount: \$497,151


Lydia Rachbauer

Lawrence Berkeley National Laboratory – Berkeley, CA

Lydia Rachbauer is a scientist in biological systems and engineering at Lawrence Berkeley National Laboratory. Rachbauer aims to develop a scalable and sustainable carbon conversion process to minimize greenhouse gas emissions in the aviation sector. The approach leverages the microbial conversion of waste-derived syngas into the C6-carboxylic acid caproate as a precursor for sustainable aviation fuels.

Project: C1 Bioconversion Platform: Integrating Acetogenic Consortia for Circular Economy Solutions in Sustainable Fuel Production, Industrial Efficiency, and Decarbonization – Award Amount: \$499,501


Julie Rorrer

University of Washington – Seattle, WA

Julie Rorrer is an assistant professor of chemical engineering at the University of Washington. In this project, Rorrer will harness plastic waste to produce liquid organic hydrogen carriers, addressing plastic pollution and hydrogen storage needs simultaneously. The process uses an adaptive catalytic reactor that converts various plastic wastes using different modes depending on the availability of hydrogen.

Project: Development of an Adaptive Catalytic Reactor to Store Intermittent Green Hydrogen Using Plastic Waste – Award Amount: \$500,000



Adam Uliana

ChemFinity Technologies – Brooklyn, NY

Adam Uliana is the co-founder and CEO of ChemFinity Technologies, a cleantech startup in Brooklyn, NY, that spun out of University of California, Berkeley in 2022. Uliana is developing new processes to recycle critical minerals by leveraging ChemFinity's porous sorbent material technology. The approach selectively recovers many critical minerals from wastes, including e-waste, spent catalytic converters, and other sources.

Project: Tunable Porous Polymer Networks with Unprecedented Efficiency in Recovering Critical Metals – Award Amount: \$500,000



Zhongyang Wang

University of Alabama – Tuscaloosa, AL

Zhongyang Wang is an assistant professor in chemical and biological engineering at the University of Alabama. Wang will use sodium borohydride as a liquid fuel for a direct borohydride fuel cell to empower marine vessels. Sodium borohydride is readily transportable using existing infrastructure, and no greenhouse gases would be generated during the operation of the liquid-liquid fuel cell.

Project: Tailoring Bipolar Membrane Interfaces to Boost Direct Borohydride Fuel Cell Performance for Marine Transportation Applications – Award Amount: \$499,803



Xizheng Wang

University of California, Irvine – Irvine, CA

Xizheng (Zoe) Wang is an assistant professor in mechanical and aerospace engineering at the University of California, Irvine. Wang will investigate a better method to produce multi-elemental nanodisks to enable scalable clean hydrogen production. The electrified vapor deposition method will produce nanodisks that can reduce or eliminate the usage of precious metals for a more robust and sustainable supply chain.

Project: High-Entropy Nanodisks by Ultrafast Electrified Vapor Deposition for Hydrogen Production – Award Amount: \$500,000

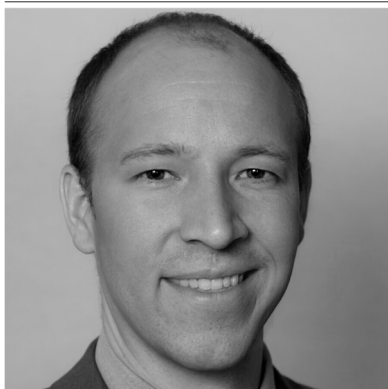


Jun Wang

University of Nebraska-Lincoln – Lincoln, NE

Jun Wang is an assistant professor in electrical and computer engineering at the University of Nebraska-Lincoln. Wang is developing solutions to enhance power grid resilience through a first-of-its-kind 10-kilovolt high-frequency press-pack silicon-carbide MOSFET module. The module will have 30 times faster switching frequency and 5 times higher power density than the state of the art.

Project: Multicell Electrical-Transient-Accelerated Press-Pack Modules (METAPAK) – Award Amount: \$500,000



Andrew Westover

Oak Ridge National Laboratory – Oak Ridge, TN

Andrew Westover is a staff scientist at Oak Ridge National Laboratory with a focus on solid-state batteries. Westover's project will develop bulk ionic glasses (BIG) using traditional glass processing that captures the desirable ductility of LiPON glass. The ultimate project goal is demonstrating lithium-metal anode charging/discharging using a BIG electrolyte separator, a traditional cathode, and a Li metal anode.

Project: Ductile Bulk Ionic Glasses for Electric Vehicle Batteries (BIGBATT) –

Award Amount: \$500,000



Michael Woods

Battelle Energy Alliance (Idaho National Laboratory) – Idaho Falls, ID

Michael Woods is a research scientist at Idaho National Laboratory with over ten years of experience in molten salt experimentation. Woods' project will investigate the use of brazing for joining salt-facing materials for molten salt energy technologies, including nuclear molten salt reactors and thermal energy storage systems.

Project: Performance of Brazed Materials for Molten Salt Energy Technologies –

Award Amount: \$500,000



Guang Yang

Oak Ridge National Laboratory – Oak Ridge, TN

Guang Yang is a member of the energy storage and conversion group at Oak Ridge National Laboratory. Yang is working to revolutionize energy storage by creating a groundbreaking battery that uses low-cost materials like sodium and carbon dioxide. The battery could be up to 40 times more powerful and 90% cheaper than current technologies.

Project: Supercritical Carbon Dioxide-Leveraged Redox Flow Batteries

(SUPERCOOL-RFB) – Award Amount: \$500,000



Yangying Zhu

University of California, Santa Barbara – Santa Barbara, CA

Yangying Zhu is an assistant professor in mechanical engineering at the University of California, Santa Barbara. Zhu will develop a desalination system using solar thermal energy and multi-stage distillation. The work will enhance thermal transport processes to utilize energy more efficiently, which can significantly reduce energy consumption compared to existing industrial desalination processes.

Project: Solar Thermal Membrane Desalination via Thin-film Phase Change –

Award Amount: \$500,000