Energy storage research and development palikir

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JCESR pursues this vision by delivering transformative materials for batteries - including cathodes, anodes, electrolytes and interfaces - each modified with intentional defects and disorder to enhance performance.

JCESR will deliver these transformative materials by designing and building them from the bottom up, atom-by-atom and molecule-by-molecule, where each atom or molecule plays a prescribed role targeting overall materials behavior.

The U.S. Department of Energy (DOE) announced its decision to renew the Joint Center for Energy Storage Research (JCESR), a DOE Energy Innovation Hub led by Argonne National Laboratory and focused on advancing battery science and technology. The announcement was made by DOE Under Secretary for Science Paul Dabbar at the InnovationXLab Energy Storage Summit.

JCESR comprises a collaborative set of partners with capabilities and expertise unmatched in any single institution. From the outset we identified institutions with demonstrated expertise and proven capabilities with a willingness to break barriers and think outside the traditional box in order to transform the battery landscape. Our partner set integrates the researchers, ideas, and tools of 18 institutions from national laboratories, universities, and industry.

Since 2012, JCESR focused on identifying materials in the "beyond-lithium-ion" space with the potential to revolutionize energy storage. Our reductionist approach resulted in new knowledge and concepts that impact the energy storage community beyond JCESR. We are now focused on delivering transformative materials for batteries, each with intentional defects and disorder to enhance performance, leaving a legacy of a diversity of batteries for a diversity of uses.

In the first five years of JCESR, our 150+ researchers hailing from 20 institutions published 380+ papers, submitted 32 patent applications and 70 invention disclosures, and launched 3 startups. Our community reach includes 95 JCESR alumni and 100+ affiliates hailing from 25 states and 4 countries. JCESR"s 95 alumni span graduate students, postdocs, and mid-career researchers who represent our legacy in universities, national laboratories, and private industry worldwide. This human capital is one of our most impactful and enduring contributions to the energy storage community.

JCESR is a leader in the scientific community, both initiating and participating in important energy storage conferences worldwide. Recognizing the importance of lithium sulfur to transform the current battery landscape, in 2016 JCESR teamed with OXIS Energy and Imperial College London to initiate the Li-SM3 Conference, providing a forum for international collaboration. In addition, JCESR researchers participate in several scientific conferences and regional events throughout the year in a leadership position.

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The simulation of perfect crystalline materials for cathodes with the Materials Project and of organic molecules for electrolytes with the Electrolyte Genome allows thousands of new materials to be explored for energy storage applications. Multimodal characterization of materials by X-rays, infrared spectroscopy, electron microscopy, and nuclear magnetic resonance enables rapid fundamental understanding of the atomic and molecular origins of overall materials behavior. JCESR continues to significantly enhance the capabilities of these incisive tools and apply them in new contexts.

ESRA unites leading experts from national labs and universities to pave the way for energy storage and next-generation battery discovery that will shape the future of power. Led by the U.S. Department of Energy"s Argonne National Laboratory, ESRA aims to transform the landscape of materials chemistry and unlock the mysteries of electrochemical phenomena at the atomic scale.

ESRA science opens the door to creating ultra-high energy density rechargeable batteries known as metal-air cells. It will also help accelerate solid-state battery chemistry and spur the development of organic soft materials to enable energy storage that involves multiple electron reactions.

ESRA thrives within a dynamic ecosystem of collaboration. Its partners and advisors span national labs, leading universities, and industry pioneers. By fostering innovation and developing battery materials that prevent the U.S. from being vulnerable to supply chain risks, ESRA discoveries promise a new era of sustainable energy storage.

The ESRA team is committed to cultivating a diverse next-generation battery workforce through training programs that bridge academia, industry, and government, ensuring the development of skilled professionals poised to lead in battery research and future manufacturing. ESRA partners include three minority serving institutions and Xavier University of Louisiana, a historically Black college.