Department of Energy, Office of Science
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Lead Institution	State	EFRC Name	EFRC Director	EFRC Objective
Lawrence Berkeley National Laboratory	CA	Center for Novel Pathways to Quantum Coherence in Materials	Moore, Joel	Understand and control coherence in solids to open new frontiers in quantum information science, electronics, and optics.
Stanford University	CA	Photonics at Thermodynamic Limits (PTL)	Dionne, Jennifer	Achieve photonic operations at thermodynamic limits by controlling the flow of photons, electrons, and phonons in atomically-architected materials, and thereby enable entirely new energy conversion systems.
Stanford University	CA	Center for Mechanistic Control of Water-Hydrocarbon-Rock Interactions in Unconventional and Tight Oil Formations	Kovscek, Anthony	Seek a fundamental understanding of non-equilibrium chemical and physical processes occurring in shale, creating a scientific basis for increasing the efficiency of hydrocarbon production and minimizing waste.
University of California, Berkeley	CA	Center for Gas Separations (CGS)*	Long, Jeffrey	Develop the science needed to tailor materials and membranes exhibiting optimal performance in a range of key gas separation processes.
University of California, Los Angeles	CA	Center for Synthetic Control Across Length-scales for Advancing Rechargeables (SCALAR)	Tolbert, Sarah	Exploit multiscale materials synthesis to enable the integration of new types of chemistry into battery materials and systems.
University of California, Riverside	CA	Spins and Heat in Nanoscale Electronic Systems (SHINES)*	Shi, Jing	Understand the fundamental interactions of spin, charge, and lattice and their excitations in quantum materials and heterostructures to discover new mechanisms that control spin and energy transport.
University of California, San Diego	CA	Quantum Materials for Energy Efficient Neuromorphic Computing (Q-MEEN-C)	Schuller, Ivan	Enable energy-efficient, fault-tolerant, neuromorphic computation based on quantum materials including nano-arrays of oxides, magnetic multilayers, and nano-lasers.
National Renewable Energy Laboratory	CO	Center for Hybrid Organic-Inorganic Semiconductors for Energy (CHOISE)	Beard, Matthew	Target unprecedented synthetic control over the emergent phenomena of spin, charge, and light-matter interactions, in tailored organic-inorganic perovskite-inspired systems for energy science.

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National Renewable Energy Laboratory	CO	Center for Next Generation of Materials Design (CNGMD)*	Tumas, William	Rapidly design and discover new functional materials, incorporate metastable systems into materials design, and predict synthesis pathways.
University of Delaware	DE	Catalysis Center for Energy Innovation (CCEI)	Vlachos, Dionisios	Design resource-efficient, selective, thermocatalytic conversion of lignocellulosic biomass, co-processed with fatty acids and/or shale gas, into high-value, building-block chemicals and molecules with superior properties.
University of Florida	FL	Center for Molecular Magnetic Quantum Materials (M2QM)	Cheng, Hai-Ping	Exploit the rich complexities of molecular magnetic systems as foundational ingredients for quantum computing, quantum electronics/spintronics, and revolutionary sensors at yocowatt sensitivity.
Georgia Tech	GA	Center for Understanding and Control of Acid Gas-Induced Evolution of Materials for Energy (UNCAGE-ME)	Walton, Krista	Harness a deep knowledge of acid-gas interactions with a broad class of materials to accelerate materials discovery in acid gas separations, conversion, and utilization.
Ames Laboratory	IA	Center for the Advancement of Topological Semimetals (CATS)	McQueeney, Robert	Harness new functionalities of topological semimetals for transformative changes in areas such as mid-infrared photodetection, light harvesting, and spintronics.
Idaho National Laboratory	ID	Center for Thermal Energy Transport under Irradiation (TETI)	Hurley, David	Accurately model and control electron- and phonon-mediated thermal transport in advanced nuclear fuels.
Argonne National Laboratory	IL	Advanced Materials for Energy-Water Systems (AMEWS)	Darling, Seth	Understand and design adsorption, reactivity, and transport at water-solid interfaces to enable future advances in materials for efficient water treatment.
Argonne National Laboratory	IL	Center For Electrolyte-Electrode Interface Science (CEES)*	Fenter, Paul	Design and synthesize solid electrolytes that exhibit both functionality and robust stability when interfaced with solid electrodes at the extreme potentials required for next-generation electrochemical energy storage.

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Northwestern University	IL	Center for Bio-Inspired Energy Science (CBES)	Stupp, Samuel	Expand the next frontier in soft materials by developing structures that emulate many of the properties we see in biological systems.
Northwestern University	IL	Center for Light Energy Activated Redox Processes (LEAP)*	Wasielewski, Michael	Use efficient light-driven multi-electron redox processes to power energy-demanding chemistry.
Harvard University	MA	Integrated Mesoscale Architectures For Sustainable Catalysis (IMASC)	Friend, Cynthia	Identify catalyst systems that can improve the energy efficiency of chemical production by improving selectivity.
Massachusetts Institute of Technology	MA	The Center for Enhanced Nanofluidic Transport (CENT)	Strano, Michael	Enable new energy-efficient aqueous separation and chemical purification processes by understanding fluid flow and molecular transport in single-digit nanopores.
Johns Hopkins University	MD	Institute for Quantum Matter (IQM)	Broholm, Collin	Discover and understand emergent properties in hard condensed matter with the potential for transformative impact on energy and information technologies.
University of Maryland, College Park	MD	Precision Ion-electron Control in Solid State Storage (PICS3)*	Rubloff, Gary	Develop the underlying science, from atomic scale interfaces to mesoscale architectures, that underpins 3D solid-state energy storage.
University of Minnesota	MN	Inorganometallic Catalyst Design Center (ICDC)	Gagliardi, Laura	Computationally guide the discovery of new classes of energy-science relevant catalytic materials and their underlying structure-function relationships critical to advancing further catalyst discovery.
The University of North Carolina at Chapel Hill	NC	Alliance for Molecular PhotoElectrode Design for Solar Fuels (AMPED)*	Meyer, Gerald	Develop the fundamental molecular basis for solar-driven water oxidation and carbon dioxide reduction catalysis.
Princeton University	NJ	Bioinspired Light-Escalated Chemistry (BioLEC)	Scholes, Gregory	Employ light harvesting and advances in solar photochemistry to enable unprecedented photoinduced cross-coupling reactions that valorize abundant molecules.

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Los Alamos National Laboratory	NM	Fundamental Understanding of Transport Under Reactor Extremes (FUTURE)	Uberuaga, Blas	Understand the coupling between radiation damage and corrosion and predict irradiation-assisted corrosion in passivating and non-passivating environments for materials in nuclear energy systems.
Brookhaven National Laboratory	NY	Molten Salts in Extreme Environments	Wishart, James	Provide a fundamental understanding of molten salt bulk and interfacial chemistry that will establish robust principles underpinning molten salt reactor technology.
Columbia University	NY	Programmable Quantum Materials (Pro-QM)	Basov, Dmitri	Effectively program quantum properties by discovering new forms of quantum matter controllable by light, gating, atomic-layer assembly, magnetic proximity, and nanomechanical manipulation.
Cornell University	NY	Center for Alkaline-Based Energy Solutions (CABES)	Abruña, Héctor	Understand the nature, structure, and dynamics of electrocatalysis in alkaline media to enable advanced fuel cell technologies.
SUNY Binghamton	NY	NorthEast Center for Chemical Energy Storage (NECCES)*	Whittingham, M. Stanley	Understand the rates and limits of the transformations that occur in an electrode composite structure, from the atomistic level to the macroscopic level, throughout the lifetime of a functioning battery.
SUNY Stony Brook	NY	A Next Generation Synthesis Center (GENESIS)	Parise, John	Accelerate the discovery of functional materials by integrating advanced in situ diagnostics and data science tools to interrogate, predict and control the pathways that govern synthesis.
SUNY Stony Brook	NY	Center for Mesoscale Transport Properties (m2M)	Takeuchi, Esther	Create scalable electrochemical energy storage systems with high energy, power, and long life by probing transport properties in materials and across interfaces under dynamic conditions from the molecular to the mesoscale.

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Case Western Reserve University	OH	Breakthrough Electrolytes for Energy Storage (BEES)	Savinell, Robert	Develop the structure-property relationships of deep eutectic solvents and soft nanoparticles necessary for a bottom-up design of innovative electrolytes tailored for energy storage applications.
Temple University	PA	Center for Complex Materials from First Principles (CCM)*	Perdew, John	Improve the methods of electronic structure calculations for both simple and complex materials.
The Pennsylvania State University	PA	Center for Lignocellulose Structure and Formation (CLSF)	Cosgrove, Daniel	Develop a detailed nano- to meso-scale understanding of plant cell walls, from cellulose microfibril formation to the assembly of microfibrils with other cell wall components to form versatile plant cell walls.
Oak Ridge National Laboratory	TN	Fluid Interface Reactions, Structures and Transport (FIRST) Center	Dai, Sheng	Understand the atomistic origins of electrolyte and coupled electron transport under nanoconfinement that will enable transformative advances in capacitive electrical energy storage and other energy-relevant interfacial systems.
Oak Ridge National Laboratory	TN	Energy Dissipation to Defect Evolution (EDDE)*	Zhang, Yanwen	Exploit concentrated solid-solution alloys to control energy dissipation and defect evolution under extreme conditions and guide the design of radiation-tolerant structural alloys for applications in nuclear energy.
The University of Texas at Austin	TX	Center for Materials for Water and Energy Systems (M-WET)	Freeman, Benny	Design polymeric membranes for selective decontamination or resource recovery from complex aqueous mixtures in energy applications.
University of Utah	UT	Multi-Scale Fluid-Solid Interactions in Architected and Natural Materials (MUSE)	Butt, Darryl	Understand fluid and solid interfacial properties in hierarchical, architected, and natural nanostructured geomaterials with varying levels of physical and chemical heterogeneities.
Pacific Northwest National Laboratory	WA	Center for Molecular Electrocatalysis (CME)	Bullock, Morris	Establish fundamental principles needed for efficient interconversion of electrical energy and chemical bonds through precise control of electron and proton transfers.

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University of Washington	WA	The Center for the Science of Synthesis Across Scales (CSSAS)	Baneyx, François	Harness the complex functionality of hierarchical materials by mastering the design of building blocks that predictively self-assemble into responsive, reconfigurable, self-healing materials.
Washington State University	WA	Biological Electron Transfer and Catalysis (BETCy) EFRC*	Peters, John	Understand at the atomic level the mechanisms that biocatalysts use to efficiently transform electrochemical potential energy into chemical bonds.

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