Materials for Energy Roadmap

Legend (Text Font): Done | Ongoing | Not yet Available

OVERALL STRATEGIES

Needs for Government Facilities and Lab
- Continuous support for ADMATEL
- National centralized testing facility for electrochemical characterization, prototyping, failure analysis, etc.
- There needs to be more facilities involved, to focus on a specific type of material, to further hasten and improve the overall results attained per material.

Needs for Human Resources
- Human resource and institution building for electrochemical characterization, prototyping, failure analysis, among others
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R&D Program / Project Needs
- Supercapacitor R&D Program
- Fuel Cell R&D Program
- Local and international collaborative R&D
- NICER-CAMCET Program components (2021-2024):
- Project 1: Biomass-Derived Nanomaterials as Novel Electrocatalyst Components for DEFC
- Project 2: Fabrication of Nanostructured Silica-based Nanocomposite Membranes for PEMFCs
- Project 3: Plant-Derived Biochar as Fabric-Based Electrode Materials for Supercapacitor Devices
- DOST-MOST: The Development of High-performance and Low-cost Membrane Electrode Assembly for Alkaline Fuel Cell Based on Ion/Electron Dual Conducting Catalyst Layers (2021-2023)
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S&T Policy Initiatives
- Ensure communication of government policy incentives and benefits to stakeholders

10M

Use of computational methods

2020-2021

-Supercapacitor and Fuel Cell R&D Programs initialized
-Fuel Cell and Electrolyser R&D program launched
-Setup of facilities and manpower for the national centralized testing facility

78M

- Establishment of a robust research and testing infrastructure

Development of electrode materials for EDLC and pseudocapacitor; separators and electrolytes

Conducting Polymers and Metal Oxides

2022

Computational analysis on Reduction of CO_2, Battery interfaces, and ORR electrocatalysis for next generation instruments for storage and energy conversion

20 M

- Design and development of components: electrode, flow field, electrocatalysts, electrolyte, ionomer, membrane, hydrogen and liquid fuels, catalyst support; Pt-free and metal-free catalysts

Reduction of Frictional Losses/Cost Reduction of Flywheel

New catalyst with low overpotentials for oxygen reduction to make the system more efficient, cost effective, and bifunctional

Air electrodes with high electrochemical activity and lower polarization/resistance

Low-cost organometallic catalysis for air electrodes

2023

Established Energy Research and Innovation Center (ERIC)

Assistance for spinoff/startup Developed business models and pricing for its services

Fabrication of a Novel Material as Anode Electrode for High Power Generation Al-Air Battery

20 M

- Development of energy storage devices;

Hybrid capacitors (composite hybrids and battery type);

Advanced technologies on lead-acid and Li-ion;

Mobile energy source (wearables, ambient energy harvester)

2024

Energy systems integration and application
- Transportation (battery for electric vehicle charger)
- Stationary (pumped-storage hydropower, compressed & liquid air energy storage, superconducting magnetic energy storage, flywheel, etc)

Small portable energy system for small or lightweight applications such as mobile medical bracelets, or field sensors

20 M

- Fabrication and testing of single cell, fuel cell, electrolyser, metal-air battery; Upscale production of components; Design and integration of fuel stack

- Develop non-aqueous flow battery systems with wider cell operating voltages to improve efficiency

2025

Enhanced capabilities, functionalities, and applications

Small portable energy system for small or lightweight applications such as mobile medical bracelets, or field sensors

20 M

Upscale production of components; Design and integration of fuel stack

2026

Enhanced capabilities, functionalities, and applications

Medium scale energy systems like power banks or longer life cycle disaster relief/rural handhelds like radios and high powered flashlights

20 M

Development of Smart Energy systems

2027

Enhanced capabilities, functionalities, and applications

Implementation of wider scale applications such as long-term and reliable 'internet of things' networking or monitoring in an industrial setting

20 M

Post litium Ion batteries (multivalent element, Na-ion batteries, solid-state batteries)

Post silicon semiconductor substrates including silicon carbide (SiC) and Gallium Nitride (GaN)

2028

Advanced capabilities, functionalities, and applications

Large scale applications such as energy storage devices focused on long distance transportation

MILESTONES

VISION

Provision of enabling technologies for applications beneficial to society.

OVERALL OUTCOME

Locally-developed products and services intended for supercapacitors, fuel cells, and batteries