Rechargeable Lithium-Air Batteries

U.S. DEPARTMENT OF ENERGY Energy Efficiency & Renewable Energy

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Technical Approach:

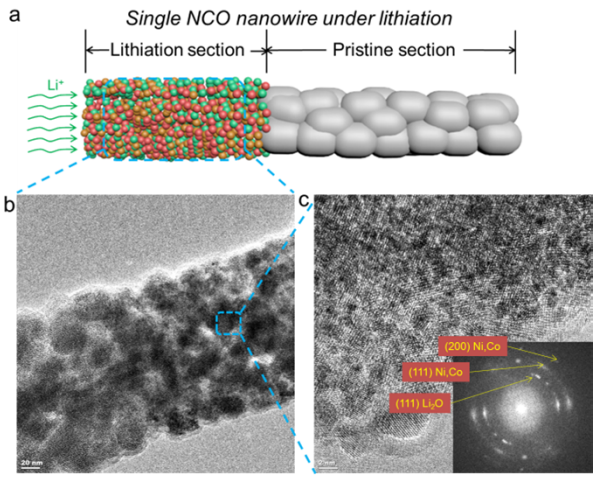
- Investigate the feasibility of using B_4C as air electrode to avoid carbon oxidation problem during charge process.
- Develop stable metal oxides as efficient catalysts.
- Modify the surface of carbon electrode to improve its stability.

Status:

- Prepared B_4C base air electrode with no free-carbon.
- Fabricated the binder-free air electrodes that enable Li-O_2 cells to retain its capacity over 1000 mAh/g for 100 cycles.

Technology:

Using in-situ TEM to study the formation of metal and metal oxide nanoparticles (~2 nm) as efficient catalysts in binder-free electrode to enhance the cycling performance of Li-O_2 cells.



Objectives:

- Develop stable air electrode to improve cycling stability of rechargeable Li-O_2 batteries.
- Develop efficient catalysts to reduce charging overvoltage.
- Improve the stability of electrolytes during oxygen reduction and evolution reactions.

Deliverables: Enhanced cyclability of Li-O_2 batteries with stabilized air electrode and electrolyte.

Funding:

FY15 budget - $200K (DOE)

Milestones:

- **Q1:** Synthesize and characterize the modified solvent and the transition metal oxide catalyst coated carbon material.
- **Q3: :** Identify a modified carbon air electrode to enhance the cyclability of Li-O_2 battery by using conventional glyme solvent.
- **Q4:** Demonstrate a Li-O_2 battery with at least 100 cycles stable operation by employing the new electrolyte and modified air electrode.