

Development of Novel Electrolytes and Catalysts for Li-Air Batteries

U.S. DEPARTMENT
OF

Energy Efficiency &
Renewable Energy

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Objective:

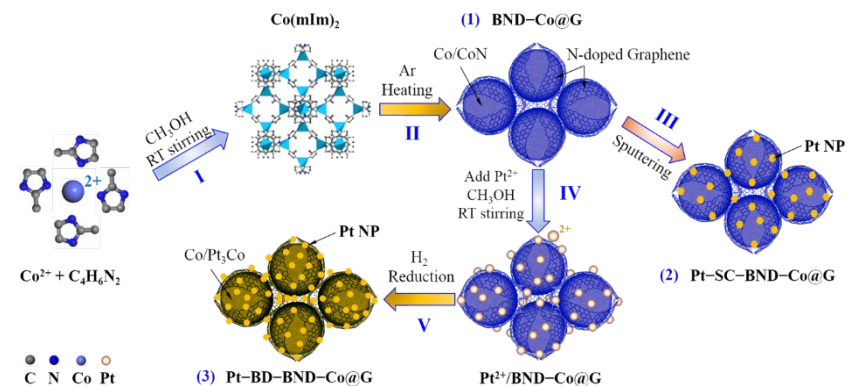
- Understand the role of electrolyte and catalyst in the discharge product growth mechanism and charge mechanism in Li-O₂ batteries through experiment and theory

Impact:

- Control of discharge and charge processes can achieve increased efficiency, cycle life, and capacity
- Li-O₂ batteries can potentially achieve high energy densities for long range vehicles

Accomplishments:

- Ir clusters of precise numbers of Ir atoms were investigated as electrocatalysts in Li-O₂ batteries and the cluster size were found to have a large impact on the charge potential.
- Computations provided insight into how Ir clusters evolve with time during discharge to form Ir₃Li particles and the dependence on electrolyte
- Encapsulated Pt and Pt₃Co nanoparticles in nitrogen doped metal organic frameworks have given high specific capacities and a dramatic reduction in charge overpotentials in Li-O₂ batteries.



Figur : Schematic of Pt modified MOF-derived catalysts. BND-Co@G = biphasic N-doped cobalt@graphene, Pt-SC-BND-Co@G = Pt surface-coating BND-Co@G, and Pt-BD-BND-Co@G = Pt bulk-doping BND-Co@G.)

FY19 Milestones:

- Effect of morphology and composition of discharge products on electronic conductivity and performance.
- Investigation of modification of electrolyte salts on the Li-O₂ performance from experiment and theory
- Development of novel electrocatalysts for longer cycle life in Li-O₂ batteries

FY19 Deliverables: Quarterly reports, new catalysts that work in synergy with electrolytes

Funding: FY19: \$500,000 FY18: \$500,000 FY17: \$400,000