Advanced Research Projects Agency • ENERGY

BEEST PROJECT

MISSOURI S&T

LITHIUM-AIR BATTERY

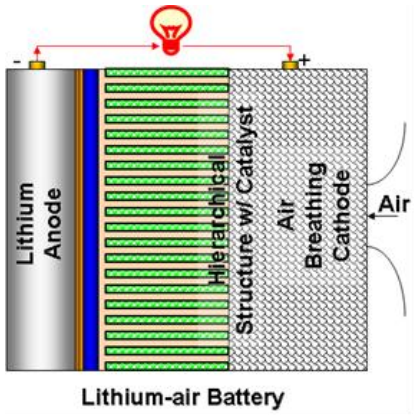
PROJECT TITLE:	High Performance Cathodes for Lithium-Air Batteries		
ORGANIZATION:	Missouri Univ. of Science & Technology (S&T)	LOCATION:	Rolla, MO
PROGRAM:	BEEST	ARPA-E AWARD:	$1,200,000
TECH TOPIC:	Vehicle Technologies	PROJECT TERM:	8/1/10 – 7/31/13
WEBSITE:	www.arpa-e.energy.gov/ProgramsProjects/BEEST.aspx		

CRITICAL NEED

Most of today's electric vehicles (EVs) are powered by lithium-ion (Li-Ion) batteries—the same kind of batteries used in cell phones and laptop computers. Most Li-Ion battery packs have a driving range limited to 100 miles on a single charge and account for nearly 65% of the total cost of EVs. To compete in the market with gasoline-based vehicles, EVs must cost less and drive farther. An EV that is cost-competitive with gasoline would require a battery with twice the energy storage of today's state-of-the-art Li-Ion battery at 30% of the cost.

PROJECT INNOVATION + ADVANTAGES

Researchers at Missouri S&T are developing an affordable lithium-air (Li-Air) battery that could enable an EV to travel up to 350 miles on a single charge. Today's EVs run on Li-Ion batteries, which are expensive and suffer from low energy density compared with gasoline. This new Li-Air battery could perform as well as gasoline and store 3 times more energy than current Li-Ion batteries. A Li-Air battery uses an air cathode to breathe oxygen into the battery from the surrounding air, like a human lung. The oxygen and lithium react in the battery to produce electricity. Current Li-Air batteries are limited by the rate at which they can draw oxygen from the air. The team is designing a battery using hierarchical electrode structures to enhance air breathing and effective catalysts to accelerate electricity production.



Lithium-air Battery

IMPACT

If successful, Missouri S&T's new Li-Air battery design would make EVs a cost-competitive and high-performance alternative to gasoline-powered vehicles.

- SECURITY: Increased use of EVs would decrease U.S. dependence on foreign oil—the transportation sector is the dominant source of this dependence.
- ENVIRONMENT: Greater use of EVs would reduce greenhouse gas emissions, 28% of which come from the transportation sector.
- ECONOMY: This battery would enable an EV to travel from New York City to Richmond, VA (335 miles) on a single charge, for less than $10 on average.
- JOBS: This project would help position the U.S. as a leader in rechargeable battery manufacturing. Currently, the U.S. manufactures only a small percentage of all rechargeable batteries, despite inventing the majority of battery technologies.

CONTACTS

ARPA-E Program Director:
Dr. Dane Boysen,
dane.boysen@hq.doe.gov

Project Contact:
Dr. Yangchuan (Chad) Xing,
xingy@mst.edu

Partner Organizations:
MaxPower Inc., NanoLab Inc.,
Brookhaven National Laboratory