

# FROM CONCEPT TO REALITY PLANNING FOR THE LONG-RANGE ELECTRIC VEHICLE

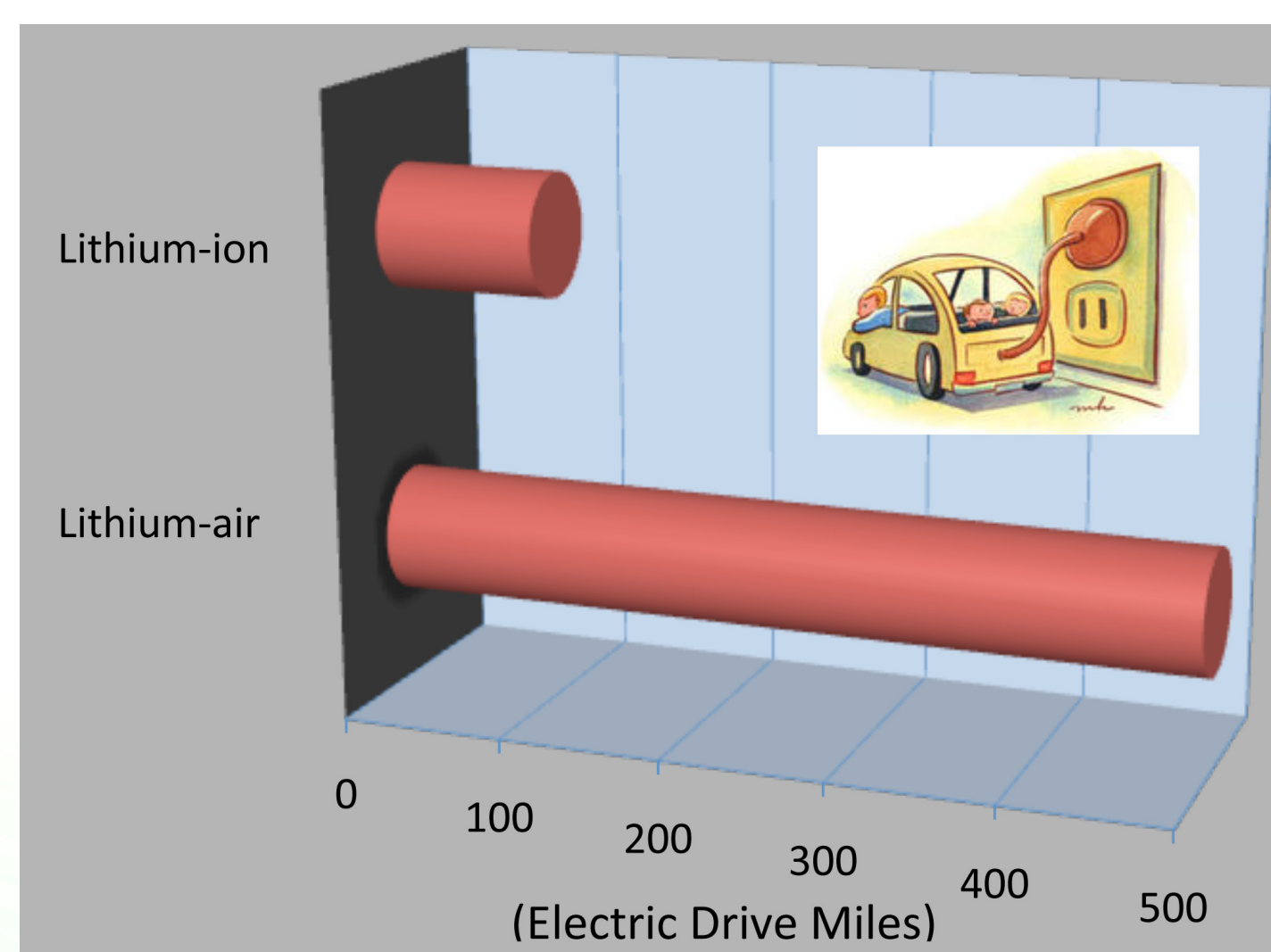
# The Lithium-air Battery

*Did you know...*

The lithium-air battery is the "holy grail" of all batteries. It uses air as fuel and offers up to 10 times the energy density of the lithium-ion battery used in the Nissan LEAF car. This means that cars based on lithium-air batteries can drive for 500 miles before charging!

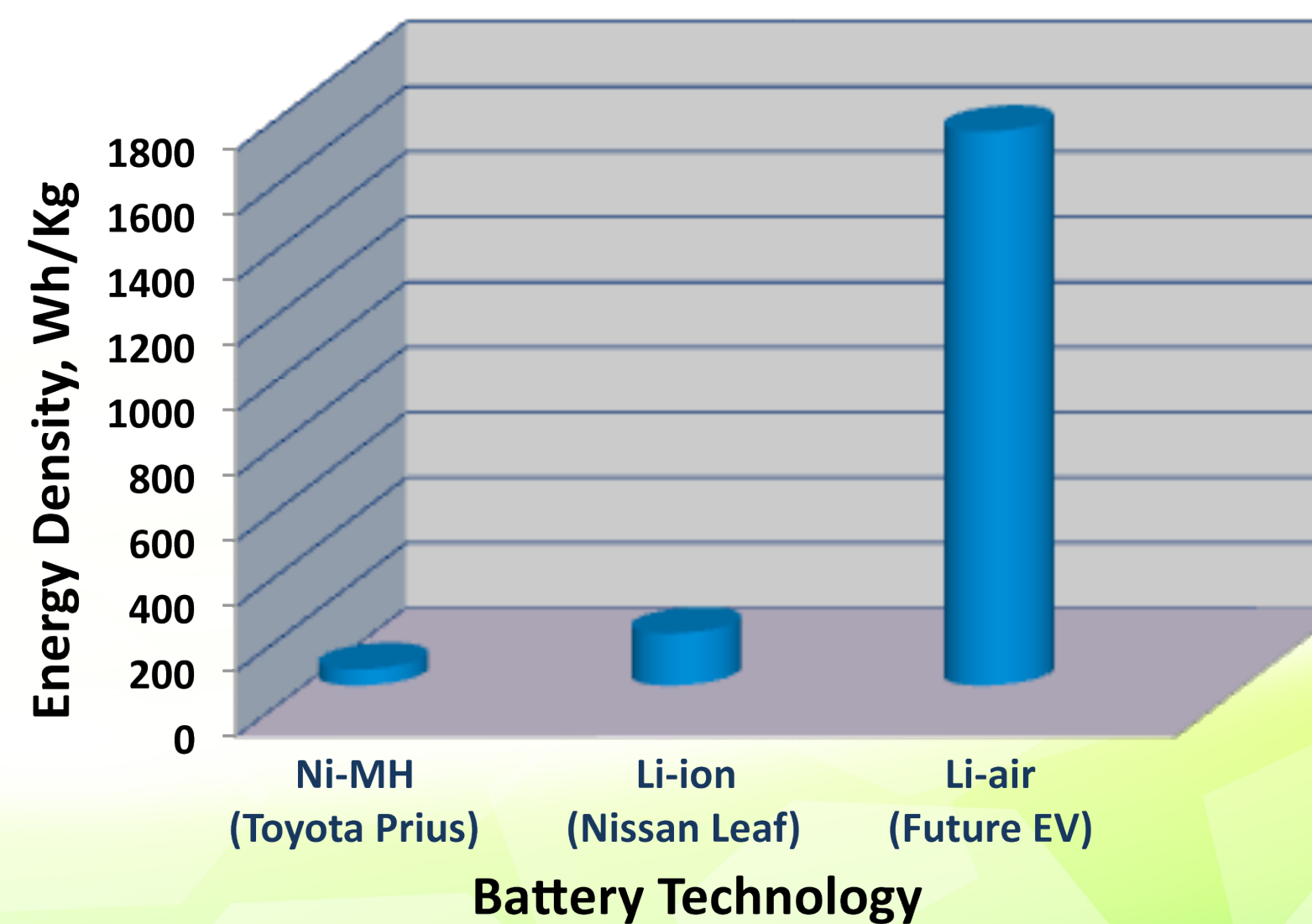
## OPPORTUNITY

Despite their huge potential, there are still significant challenges that need to be overcome before lithium-air batteries can be used in an electric vehicle. Challenges include: increasing the battery's efficiency, enhancing its power, and improving length-of-life over a wide range of temperatures.



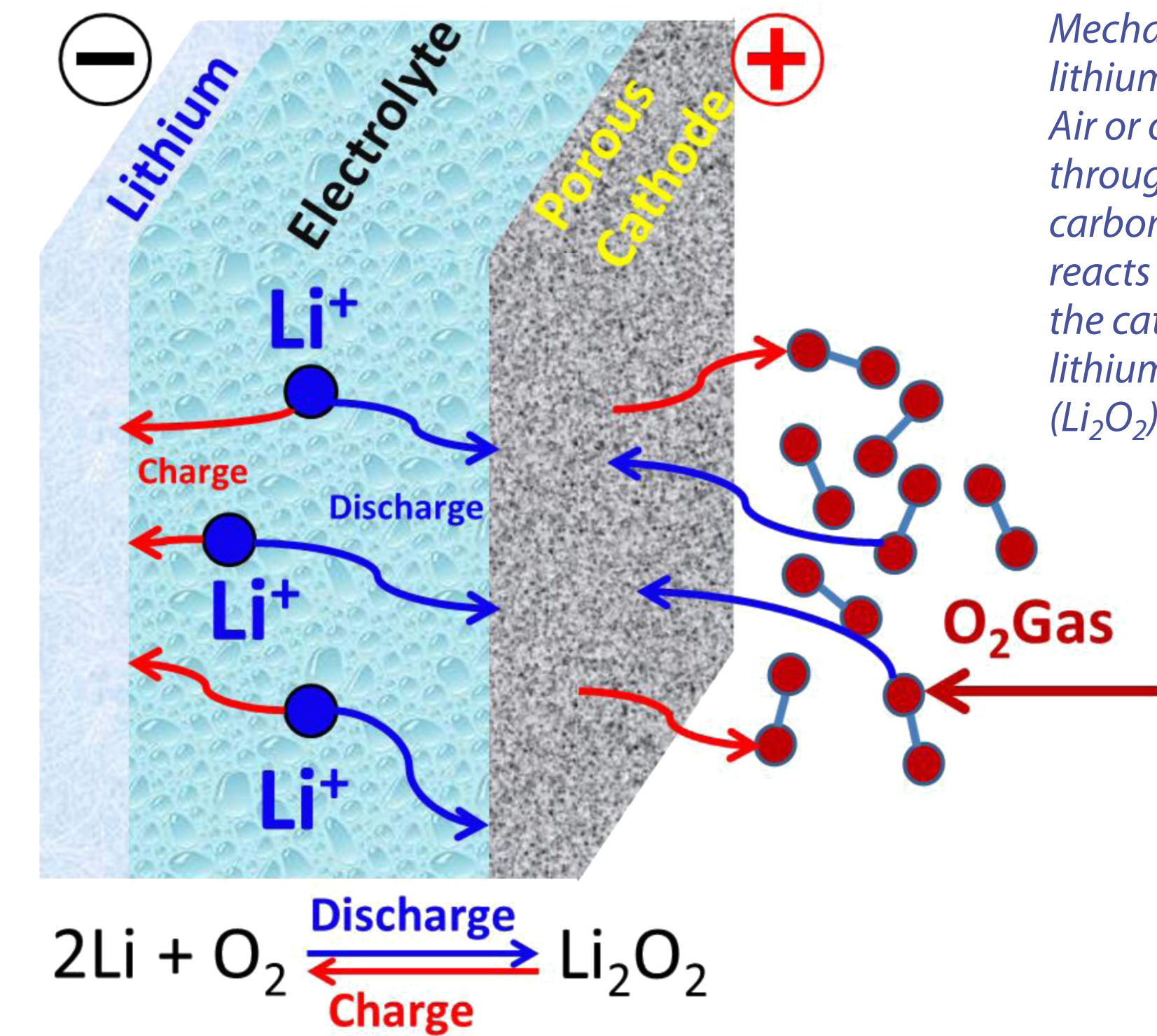
Comparison of mileage per charge of an electric car using lithium-ion and lithium-air battery.

Energy density of current battery chemistries compared with Li-air, the next generation lithium battery technology for electric vehicles.



## ARGONNE'S SOLUTION

At our world-class center for advanced battery research, we've put together a large team of scientists armed with powerful tools such as the Argonne's Advanced Photon Source, Electron Microscopy Center, Center for Nanoscale Materials and Leadership Computing Facility to research this system and to arrive at solutions that will bring this promising system to real-life application. One recent breakthrough at Argonne is the development of an advanced electrolyte system that significantly increases the efficiency of the lithium-air battery and improves its cycle life.



Mechanism of lithium-air battery. Air or oxygen flow through porous carbon cathode and reacts with Li-ions at the cathode to form lithium peroxide (Li<sub>2</sub>O<sub>2</sub>).

## POTENTIAL BENEFITS

Lithium-air batteries will make the electric vehicle much more affordable, safe and practical, with a longer electric drive range. Increasing the electrification of vehicles in the U.S. will help achieve the goal of petroleum-free transportation.

## INDUSTRY PARTNERSHIPS

Argonne is partnering with DOW Chemical (materials), Johnson Controls (battery manufacturing), and other U.S. automotive companies to solve challenging technical problems and to help deploy a domestic supply of rechargeable lithium-air batteries for transportation applications.

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