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ELECTRIC VEHICLES

'Breakthrough in performance': Battery charges in 10 minutes

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Researchers in China have developed an electrode material that they say could greatly extend the cycle life of electric vehicle batteries. General Motors Co.

An electric vehicle that charges nearly as fast as it takes to fill a conventional car with gasoline may be closer to reality, according to a new study.

Researchers have developed a lithium-ion EV battery that takes less than 10 minutes to achieve a maximum charge lasting for more than 300 miles, according to the research published last week in *Science*. Most EVs on the market today take about one hour or more to fully recharge.

To develop the battery, researchers used black phosphorous combined with graphite and a polymer gel. Black phosphorous is capable of conducting electrons and ions quickly, facilitating a quicker charge than other materials, said Hengxing Ji, professor of energy chemistry at the University of Science and Technology of China and the paper's corresponding author.

"Black phosphorous has a layered structure, and lithium ions can be quickly conducted between black phosphorous sheets," he said in a video presentation about the study.

To prevent the black phosphorous from deforming, as has been an issue in previous research, Ji and his team added graphite. They also used a polymer coating to further stabilize the battery.

The combination resulted in a battery that charges rapidly, lasts a long time on a single charge and has a long battery life cycle, according to the study. The material's energy density is about 25% greater than the energy density of high-end commercial batteries, meaning it could store more energy at a time in a smaller battery.

"With these improvements, black phosphorus composite material has achieved a breakthrough in performance," Ji said.

The researchers are now considering commercialization pathways for their battery, he said. They will need to find a way to produce black phosphorous and graphite at affordable prices, as well as optimize the battery to be compatible with industry standards, among other additional steps.

While black phosphorous has been tested before for use in lithium-ion batteries, the researchers here used a combination of materials that "appears to be novel," said Haresh Kamath, senior program manager of energy storage at the Electric Power Research Institute. Most other investigations of black phosphorous in batteries have involved the use of silicon or lithium instead of graphite, said Kamath, who was not involved in the study.

"It remains to be seen whether phosphorous can be used as a basis for practical batteries in the field, but the research is nevertheless valuable in exploring techniques that will ultimately result in batteries with longer duration, faster charge capabilities and longer product life," he said in an email.

Although charging time is generally not the most important factor for EV consumers, a vehicle that charges rapidly could be a nice added bonus, said Gil Tal, director of the Plug-in Hybrid & Electric Vehicle Research Center at the University of California, Davis. To truly shake up the EV market, however, researchers will need to develop a battery that charges quickly, retains its charge for many miles, lasts for years, and supports a safe and affordable vehicle.

"So they put in three of the five big factors," Tal said of the research.

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