Trinidad and tobago lithium-iron-phosphate batteries lfp

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$80 Regular Members & Society Affiliates

$160 Regular Members & Society Affiliates$55 Graduate Students$25 Undergraduate Students

Electric car companies in North America plan to cut costs by adopting batteries made with the raw material lithium iron phosphate (LFP), which is less expensive than alternatives made with nickel and cobalt. Many carmakers are also trying to reduce their dependence on components from China, but nearly all LFP batteries and the raw materials used to make them currently come from China. A number of companies are now planning the first large-scale LFP factories in North America. Some are partnering with established companies, and others hope to introduce new technologies that will leapfrog Chinese competitors.

At the time, Phostech was making only about 1 metric ton (t) of LFP per year. Geoffroy mixed the precursors at a facility in Quebec and cooked the mixture in a kiln in Ontario, more than 700 km away. "Then I would put it in my car and drive home," he says. "I would go to FedEx to ship it to customers."

Eventually, Phostech graduated to bigger LFP factories, culminating in a 2,400 t per year plant near Montreal in 2012. Despite the progress, LFP never caught on as a chemistry for electric vehicle batteries in North America. Carmakers in the region opted instead for cathodes made with nickel and cobalt, which offer higher energy density and more range. In 2021, Johnson Matthey, which acquired the Montreal facility in 2015, put the plant up for sale.

Nickel and cobalt prices have increased substantially in the past few years, however, and nonprofit watchdogs say mining for the metals is connected to environmental problems and child labor. Nickel-based batteries are also more likely to catch fire and can"t be recharged as many times as LFP batteries.

After initially snubbing the chemistry, several big carmakers are now turning to LFP as a way to cut lithium-ion battery costs. Ford, Rivian, and Volkswagen have all unveiled plans to use LFP in North American cars, and General Motors is interested as well. A turning point came in October 2021, when Tesla, which accounted for two-thirds of US electric car registrations last year, revealed that it would switch to LFP batteries for all its standard-range vehicles globally.

In October, the Israeli chemical maker ICL Group announced plans to build an LFP cathode powder factory in Missouri. The Norwegian start-up Freyr Battery and Utah-based American Battery Factory plan to make LFP cathode material in the US for their battery factories in Georgia and Arizona, respectively. Meanwhile, China"s Gotion High-Tech hopes to establish LFP cathode material production in Michigan. Other Chinese manufacturers are also weighing how to leverage their expertise in North America.

In November, the start-up Nano One Materials finalized the purchase of the old Phostech LFP plant in Montreal, promising to introduce a manufacturing process that will require less energy and produce less waste than existing methods. Geoffroy, now Nano One"s chief commercialization officer, has returned to the factory to pilot the new process and scale it up.

"I designed it, built it, managed it, left it . . . and now we"re rebuilding," Geoffroy says. "For me, it"s a chance to do what I planned on doing with a process that I believe in."

The energy powering an electric car is released when electrons from a lithium-ion battery"s negatively charged electrode, called the anode, flow through the motor into the battery"s positively charged cathode. To balance the electrons leaving the anode, the cathode must simultaneously accept positively charged lithium ions from an electrolyte solution.

Batteries with anodes that produce lots of electrons, and cathodes that are eager to suck them up, have a high voltage, which allows them to store more energy in a given volume. Energy density can be increased by using cathode and anode materials that can store more lithium ions.