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From left: Dr Govindan Kutty Rajendran Nair, Dr Sergio G. Echeverrigaray and Dr Yang Jie of the NUS Centre for Advanced 2D Materials in the dry room of the new advanced battery lab. The facility is open to approved battery makers and enterprises keen to develop next-generation batteries. PHOTO: NATIONAL UNIVERSITY OF SINGAPORE

NUS lab to build EV battery that charges as fast as pumping petrol

$5m facility targets batteries that last 30 years – a decade longer

Osmond Chia

A facility at the National University of Singapore (NUS) is developing batteries that should allow an electric vehicle (EV) to be fully charged in the time that it takes to pump petrol at a petrol station.

Made using the metal niobium, these batteries are targeted to last a full decade longer than those powering EVs today, and possibly outlast the vehicle itself.

The fast-charging batteries are among the key projects of a new $5 million battery innovation NUS facility – backed by the National Research Foundation – that was officially opened on May 22.

It marks NUS' entry into the race to create the next-generation of batteries, as lithium-ion batteries are currently in short supply amid an electrical energy boom.

The lab was launched in collaboration with Brazilian company CBMM, the world's leading supplier of niobium, to develop fast-charging batteries with a lifespan of 30 years.

The facility allows developers to build and test all parts of their battery prototype in one site instead of them going around to multiple manufacturers to develop each battery part, said Professor Antonio H. Castro Neto, director of NUS' Centre for Advanced 2D Materials (CA2DM).

The centre is home to the new facility – the CBMM-CA2DM Advanced Battery Laboratory.

Manufacturers can use a host of battery testing tools, such as a furnace to grow new materials and X-ray scanners to study the properties of elements used.

The lab also has a dry room – where humidity is maintained at 1 per cent – and a no-oxygen chamber for battery testing, as well as a fire-proof room where the durability of prototypes can be tested safely.

"The project is very much a pilot line for battery production," said Prof Castro Neto.

"It's not a large-volume facility like a gigafactory; the idea is to produce enough batteries for third-party makers to test, get a first look at, and get (them) approved for market use."

The facility is open to approved battery makers and enterprises keen to develop next-generation batteries, said Prof Castro Neto.

He added that each project will be reviewed by a panel of scientists, who need to be convinced that the project is truly innovative rather than providing an incremental improvement to batteries already available.

The centre is first placing its bets on niobium-graphene batteries, which combine niobium's resistant molecular structure with graphene's electrical conductivity, said CBMM global head of batteries Rogerio Ribas.

Over the last four years, CBMM has sold niobium to improve the durability of batteries used in electronics like electric scooters and power tools, said Mr Ribas.

The company now aims to make the technology more convenient and longer-lasting, with a niobium-graphene battery prototype slated to be produced in 2024.

Niobium's structure is more resistant to stress while the battery is charging, which prolongs the battery's lifespan and prevents it from overheating, said Mr Ribas.

Once ready, niobium-built batteries can be charged at least 10,000 times, while keeping around 80 per cent of its starting capacity, he said. This projection is up to five times higher than what standard EV batteries today are capable of.

"If you have a battery that lasts longer, you don't have to replace and bring new materials to the market," said Mr Ribas.

The company aims to develop car batteries that can charge fully in 10 minutes – roughly three times faster than the latest fast-charging cells found in EVs today – while keeping the batteries durable and safe to use.

Mr Ribas added that it is yet to be seen how long each charge will last on a niobium-built battery, but fast-charging capabilities will mean that smaller battery packs can serve more vehicles.

These batteries are among several next-generation cells in the running to offer a more sustainable alternative to the production of lithium-ion batteries, which produce toxic waste when discarded.

Nanyang Technological University (NTU) scientists are toasting waste paper into carbon blocks for battery parts. Another NTU project is pioneering the use of fruit peels to help break down spent batteries.

NUS is also in the midst of creating a solid-state battery without flammable liquids inside.

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