Toyota nears mass production of solid-state batteries

World's biggest carmaker says stacking speed needed for full manufacturing is 'almost there'

Toyota's bZ4X electric car on display in Los Angeles last month. The company aims to more than double the range and reduce the charging times of its batteries with solid-state technology © George Rose/Getty Images

Kana Inagaki in Toyota, Japan YESTERDAY

Toyota says it is close to being able to manufacture next-generation solid-state batteries at the same rate as existing batteries for electric vehicles, marking a milestone in the global race to commercialise the technology.

Its headway in manufacturing technology follows a "breakthrough" in battery materials recently claimed by the world's largest carmaker by vehicles sold. It would allow Toyota to mass-produce solid-state batteries by 2027 or 2028.

Solid-state batteries have long been heralded by industry experts as a potential "game-changer" that could address EV battery concerns such as charging time, capacity and the risk of catching fire.

If successful, Toyota expects its electric cars powered by solid-state batteries to have a range of 1,200km — more than twice the range of its current EVs — and a charging time of 10 minutes or less.

But producing solid-state batteries in large volumes is costly and difficult, with Goldman Sachs warning of "a relatively tough path towards scaling up over the coming decade".

Problems include the extreme sensitivity of the batteries to moisture and oxygen, as well as the mechanical pressure needed to hold them together to prevent the formation of dendrites, the metal filaments that can cause short circuits.

According to Toyota, one of the most critical and difficult technologies for mass production is the assembly process, in which the layers of cathode-anode cells need to be stacked quickly and with high precision, without damaging the materials.

When asked whether Toyota was now able to produce solid-state batteries at the same rate as current lithium-ion batteries, a Toyota engineer said: “In terms of the stacking speed, we are almost there. We are going to roll out bigger volumes and check the quality.”

Toyota in September took journalists, analysts and investors on a tour of its Teiho plant in Aichi prefecture, where the company is preparing to produce solid-state batteries in large quantities.

The plant tour followed a workshop in June, in which the company claimed to have found “a solution for materials” that would make the batteries last longer and deliver a stable performance.

Toyota last week announced a partnership with energy group Idemitsu Kosan to jointly develop and produce a solid-state battery material called sulphide solid electrolyte, which the companies said was most promising in addressing the durability issue.

Development timetables have been pushed back repeatedly in the past, leaving many analysts sceptical about whether Toyota will be able to hit its latest commercialisation target.

Despite their growing confidence in manufacturing technology, executives at Toyota admit that the company still needs to improve how it ensures the quality of battery materials when they are produced in large volumes.

At a news conference last week, Toyota president Koji Sato also admitted that production volumes of solid-state batteries were likely to be small when the company rolls them out in electric vehicles as early as 2027. “I think the most important thing at the moment is to put out [the solid-state batteries] into the world and we will consider expansion in volume from there,” he said.

Other companies have also made progress recently. Chinese battery maker CATL revealed it was preparing to mass-produce its semi-solid batteries before the year’s end, while South Korea’s Samsung SDI has completed a fully automated pilot line for solid-state batteries.