Best battery for electric vehicle

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Amidst the booming influx of electric vehicles worldwide, automakers and tech companies have been focusing on optimizing the most vital and expensive part of EVs: the batteries.

They aren"t all alike, and manufacturers use a range of different kinds of batteries. So we"ve decided to select and rank the three most prominent (or promising) battery types: lithium, solid-state, and sodium-ion batteries.

Lithium-ion and solid-state batteries are very much alike. Both types use lithium to produce electrical energy and they have an anode (the battery"s negative terminal), a cathode (the battery"s positive terminal), and an electrolyte, which helps transfer ions from the cathode to the anode and vice versa.

Lithium-ion batteries are unfortunately flammable and this has mostly to do with their liquid electrolytes, which are volatile and unstable when exposed to high temperatures.

Sodium-ion batteries come up a bit short here. Sodium ions are larger and denser than lithium ions, which means that we need a whole more lot of the former to store and produce the equivalent energy.

On the upside, CATL"s sodium-ion battery (the best example we have so far) is expected to have an energy density of 160Wh/kg and will take 15 minutes to reach 80% of its charge. That"s actually on par with lithium-ion batteries currently on the market, ranging from 140 Wh/kg to 240Wh/kg.

Solid-state batteries are the biggest competitor here. The increased stability their solid electrolytes offer means that solid-state batteries can hold up to 50% more energy than their lithium-ion counterparts, while they"re expected to reach a whopping 80% charge within 12 minutes.

Lithium is a relatively rare element on Earth and its increasing demand doesn"t come without an environmental impact. According to the Institute for Energy Research, lithium extraction not only consumes millions of gallons of water, but also harms the soil and causes air contamination.

In contrast, sodium is the seventh most abundant element on Earth (1,200 times more common than lithium), and can be found pretty much anywhere on Earth, including in seawater. Plus, its extraction doesn"t come with the same environmental concerns.

On top of that, sodium-ion cells can be made with ample metals such as iron and manganese. In contrast, lithium-ion batteries require cobalt, a metal with limited geological reserves that"s also the most expensive part of the battery, priced at approximately $28,500 per ton.

The most costly option seems to be solid-state batteries, because solid electrolytes are more expensive to

produce. Specifically, solid-state batteries are projected to cost $80-90/kWh by 2030, while the price of lithium batteries is expected to reach $60/kWh by the same time.

In case you"re sad about lithium"s loss, there"s no reason to be just yet. Sodium-ion and solid-state batteries are still under development and certainly have some years ahead before they can be commercialized. It"s also possible that using recycled lithium-ion batteries will turn out to be the mainstream option by that time.

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