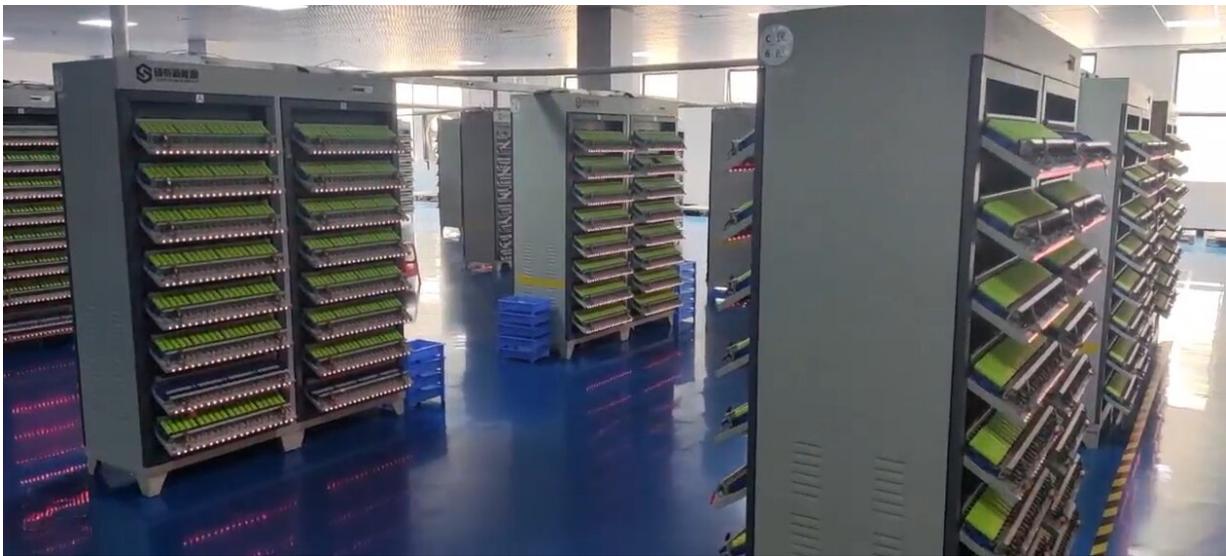


Scientists develop novel lithium-ion batteries with better performance, greater operational temperature range

May 25 2022, by Li Yuan



Lithium-ion battery products. Credit: SIAT

The lithium-ion battery (LIB) uses lithium ions as the key component of its electrochemistry. Due to its high energy density, long life, no memory effect and environmental friendliness, the Li-ion battery has been widely used in our daily lives.

However, LIBs cannot work normally or safely below 0 degrees Celsius or above 50 degrees Celsius, thus limiting their usefulness.

To overcome this problem, a research group led by Prof. Tang Yongbing from the Shenzhen Institute of Advanced Technology (SIAT) of the Chinese Academy of Sciences (CAS) recently developed a novel LIB that combines heat resistance, cold resistance, fast charging and low cost. Notably, this new [battery](#) works from -70 degrees Celsius to 80 degrees Celsius.

For this novel LIB, the research team developed a new aluminum (Al)-based composite [anode](#) material. By pairing this new anode with different cathode materials, the researchers developed batteries for different applications.

"Owing to the high theoretical capacity of the Al-based anode material, the energy density of this new battery is about 13–25% higher than traditional LIBs," said Prof. Tang, also noting that it had a longer battery life.

Furthermore, due to the good electrical conductivity of the Al-based composite anode, this product also showed outstanding fast-charging performance. It can be fully charged in 20 minutes.

In conventional LIBs, continuous cycling may generate lithium dendrites inside. This not only affects charging ability, but also pierces the separator, causing potential danger such as battery short circuits. By contrast, the new battery can effectively prevent the generation of Li dendrites under low temperature and overcharge conditions, thus improving safety performance.

Aside from their conceptual achievement, the researchers also achieved a successful mass production run for the LIB that ended May 24. Statistics showed that up to 99.11% of the LIB production output met standards, while over 99% of all [production processes](#) met standards.

Provided by Chinese Academy of Sciences

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