Researchers establish new design rule for high-entropy superionic solid-state conductors

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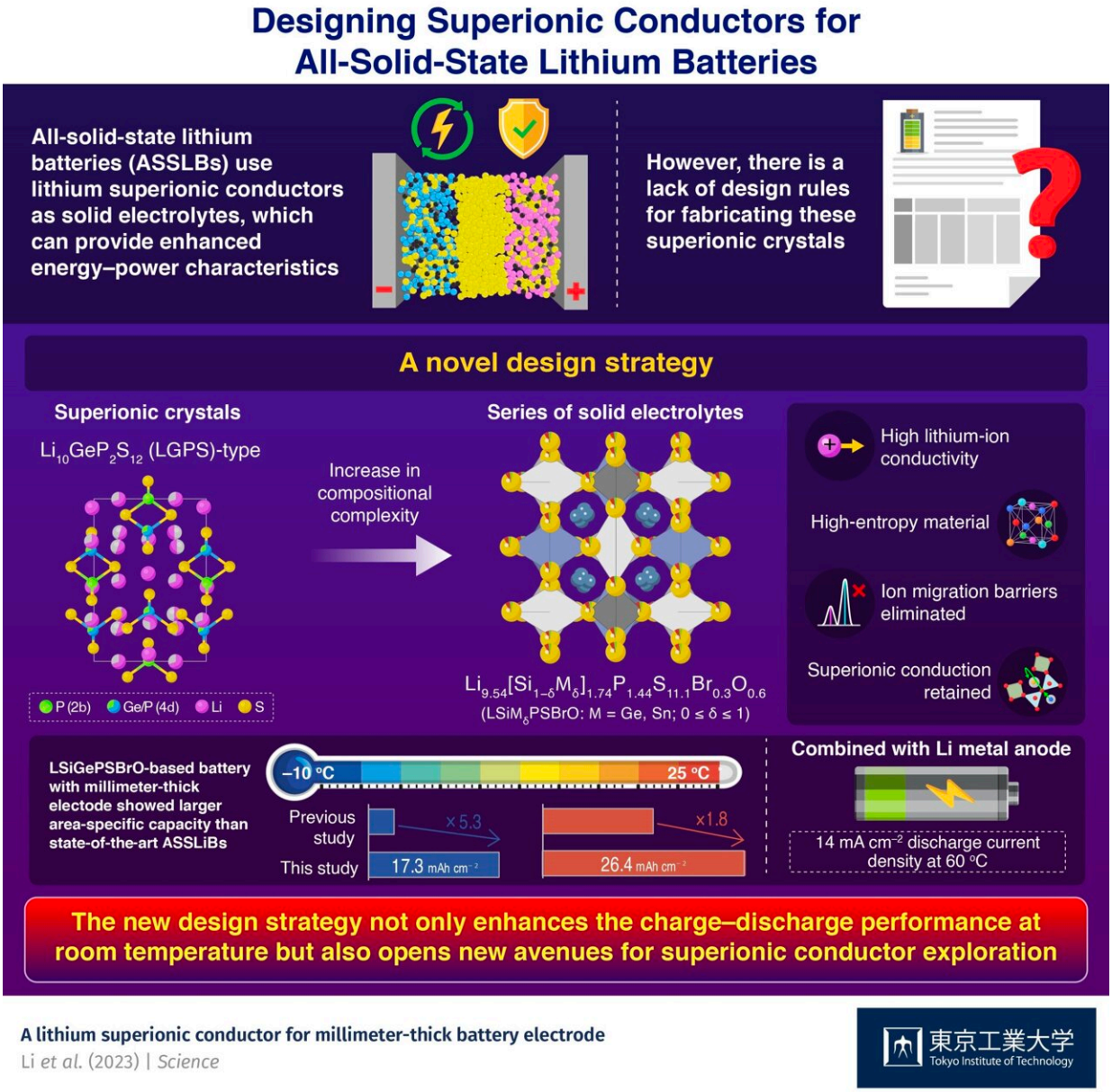

Solid electrolytes with high lithium-ion conductivity can be designed for millimeter-thick battery electrodes by increasing the complexity of their composite superionic crystals, report researchers from Tokyo Tech. This new design rule enables the synthesis of high-entropy active materials while preserving their superionic conduction. Credit: Professor Ryoji Kanno, Tokyo Institute of Technology

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As the world transitions towards a greener and more sustainable energy economy, reliance on lithium (Li)-ion batteries is expected to rise. Scientists from across the globe are working towards designing smaller yet efficient batteries that can keep up with the ever-increasing demand for energy storage.

In recent years, all-solid-state lithium batteries (ASSLBs) have captured research interest due to their unique use of solid electrolytes instead of conventional liquid ones. Solid electrolytes not only make the battery safer from leakage and fire-related hazards, but also provide superior energy and power characteristics.

However, their stiffness results in poor wetting of the cathode surface and a lack of homogenous supply of Li ions to the cathode. This, in turn, leads to a loss of capacity in the solid-state battery. The issue becomes more pronounced in thick battery cathode electrode such as millimeter-

thick one, which is a more advantageous electrode configuration for realizing inexpensive and high-energy-density battery package, compared to conventional electrode with typical thickness of