Next generation energy storage devices

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"Our work adds a new class of electrically robust polymers to the table. It opens many possibilities to the exploration of more robust, high performing materials," said Yi Liu, a chemist at Berkeley Lab and senior author on the Joule study reporting the work. Liu is the Facility Director of Organic and Macromolecular Synthesis at the Molecular Foundry, a DOE Office of Science user facility at Berkeley Lab.

The work opens new possibilities for exploring robust, high performing materials for energy storage. "We have provided deep insight into the underlying mechanisms that contribute to the material"s excellent performance," said Wu.

The polymer strikes a balance of electrical, thermal, and mechanical properties, likely due to the sulfate linkages introduced by the click chemistry reaction. Because modular chemistry accommodates extraordinary structural diversity and scalability, the same route could offer a viable path to new polymers with higher performance that meet even more demanding operational conditions.

The polysulfates are strong contenders to become new state-of-the-art polymer dielectrics. Once researchers overcome barriers in large-scale manufacturing processes for thin film materials, the devices could greatly improve the energy efficiency of integrated power systems in electric vehicles and enhance their operational reliability.

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The introduction of self-healing mechanism into flexible energy storage devices is expected to solve the problems of mechanical and electrochemical performance degradation caused by mechanical deformation.

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