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Top -level research and data

Development of next-generation energy storage devices that contribute to energy conservation and sustainable society

(Selected Papers)

- 1.A. Tsuchimoto, et al., M. Okubo, A. Yamada,
Nature Commun. 12, 631 (2021). DOI: [10.1038/s41467-020-20643-w](https://doi.org/10.1038/s41467-020-20643-w)
- 2.B. Mortemard, de Boisse, et al., M. Okubo, A. Yamada,
Nature Commun. 10, 2185 (2019). DOI:[10.1038/s41467-019-09409-1](https://doi.org/10.1038/s41467-019-09409-1)
- 3.A. Sugahara, et al., M. Okubo, A. Yamada,
Nature Commun. 10, 850 (2019). DOI:[10.1038/s41467-019-08789-8](https://doi.org/10.1038/s41467-019-08789-8)

Keyword

- Lithium-ion batteries
- Capacitors
- Solid-state ionics
- Electrochemistry
- Solid-state chemistry

Deployment targets (sites, materials, etc.)

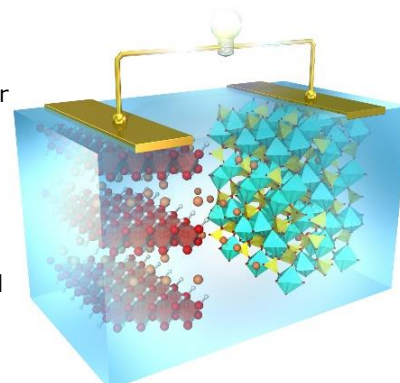
Fixed power storage systems (household use, business / industrial use, and grid use / combined use with renewable energy); in-vehicle storage batteries

Features (implementation means, etc.)

Developing power storage devices (batteries, capacitors, etc.) that provide a stable and inexpensive power supply in a sustainable society.

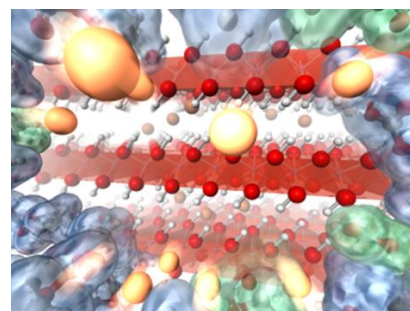
1. Batteries

Secondary batteries, which convert electrical energy into chemical energy and store / supply it at high density, play a major role as off-grid power supplies for everything from portable devices to mobile devices. However, lithium-ion batteries that are currently in use have many issues, including energy density, output density, cost, safety, and resource sustainability. With the aim of realizing secondary batteries that can solve these issues, research and development are being conducted based on the perspectives of materials science and power storage device engineering, including electrode materials that efficiently convert and store electrical energy into chemical energy, as well as electrolytes and interfaces that transmit electrical energy without loss. For example, creating unprecedented battery ideas and materials to achieve them, such as sodium-ion batteries, which have no resource constraints; aqua batteries, which ensure high safety; and anion batteries, which achieve ultra-high density energy storage.



2. Capacitors

Capacitors are energy storage devices that can store and supply electrical energy at high speeds without chemical changes, and they are essential as distributed auxiliary power sources for backing up IT systems and adding flexibility to power systems. Further widespread use is expected due to improvements in performance such as weight energy density, volumetric energy density, and cost. Development of materials and energy storage systems will be conducted, leading to the realization of high-performance capacitors, such as the construction of an interfacial structure that stores electrical energy at high density, increases in the density of energy storage that combines chemical energy, etc.



Associated proprietary technologies

Has elemental technologies (e.g., sodium ion batteries, water-based batteries, capacitors, and solid-state batteries) with high comparative advantage that can overcome the performance limits of conventional lithium-ion batteries by making breakthroughs in both higher power to enable high-speed charging and higher energy density to enable long-distance driving.

Expected outcome/ applications

Dissemination and expansion of solar power generation, wind power generation, electric cars, electric buses, smart houses, smart offices, and so on

Associated SDGs

