

# Development of submarine energy storage batteries

Are lithium-ion batteries a good option for submarine operations?

Credit: tkMS The latest developments in Lithium-ion battery (LIB) systems in the underwater domain have resulted in significant advantages for submarine operations compared to standard lead-acid batteries and have increased the number of new submarine procurement programmes.

Why do Submarines need lead-acid batteries?

For over a century, lead-acid batteries have been the standard source of stored energy for marine vehicles; they are utilized to power the vehicle's main propulsion, or as a stand-by battery. However, more is required of submarines - they must demonstrate increased endurance and cope with greater speed demands.

Which hydride storage systems are suitable for small submarines?

Compressed, and metal hydride-based H<sub>2</sub> storages are suitable for small to medium submarines. The most critical development in conventional underwater applications in recent years is to use hydrogen energy systems, including Air Independent Propulsion (AIP) systems.

What is the main power source of a submarine?

The battery remains the main power source of conventional submarines; the operational advantages of the LIB already exceed those of the lead-acid batteries, and are projected to evolve further over time.

What is underdeveloped in the field of rechargeable seawater batteries?

Currently, various aspects of related research are still underdeveloped, including the development of materials, the establishment of structure-performance relationships, and the improvement and design of battery components and structures. Continued efforts are needed to advance these areas.

### 3.5. Applications of rechargeable seawater batteries

Which technology is suitable for a small submarine?

For submarines, as another underwater application, metal hydrides and compressed hydrogen storage are suitable for small to medium-sized submarines. However, reforming technology, which provides onboard hydrogen production, combined with PEM fuel cell is decidedly suitable for large-scale submarines as Air Independent Propulsion system.



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