

Solid-State Batteries – An Alternate to **Conventional Batteries?**

Solid-state batteries use solid electrodes/electrolytes instead of liquid or polymer gel electrolyte. Both conventional lithium batteries and solid-state lithium batteries are composed of lithium and other doping materials; the difference just lies in the electrolyte. Since solid state batteries are not flammable, therefore there is no need to have safety components, enabling more space to put more active materials which increases the battery capacity.

For energy storage, this opens the possibility for attaining safe and high energy density in conventional and new applications. However, its practical realization and commercialization is still a challenge due to underlying material and cell level issues.



Conventional Battery

- Has low processing cost, with flexible separators that can endure high mechanical stress.
- Possesses high iconic conductivity at room temperature.
- Is flammable due to the electrolytes used.
- SEI layer is formed due to which shelf life is reduced.
- Restricted choice of cathode materials due to electrolyte reaction
- Possesses poor thermal stability and is sensitive to overcharge.

• Possesses high thermal stability and has less self-discharge.

Solid-State Battery

- Contains high ionic conductivity over a broad range of temperatures
- Electrolytes used are non-volatile, therefore the batteries are non-flammable and relatively safer.
- Has high energy density and tolerance.
- No SEI layer formation, and thus a longer life cycle
- In case of additional stress, ceramic separator used can break.
- Challenges with mass production and commercialization. For example, it is important to produce solid electrolytes that can be packed tightly but remain flexible, so that the ions and electrons can flow easily while the anode has room to expand and contract, which proves to be a challenge while mass producing.

Companies Focusing on Solid State Batteries:

- Quantum Scape
- Solid Power
- Briahtvolt
- Factorial Energy
- Ilika
- Toyota Motor Corp