

# Transparent All Solid State Li-S Microbatteries

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- We (First Flight Hybrid Energy Technologies LLC) develop and supply battery materials of the highest energy density and supreme performance on the market, ranging from microbatteries to long-range electric vehicle batteries. We design and develop various battery prototypes in all solid state format;
- Here our mission is to develop transparent all solid state Li-S microbatteries suitable for sensor and wearable medical devices;
- Sensors and wearable medical devices need extremely good microbatteries since they deal with human life, more and more people are using medical devices that you can wear and other small medical devices, e.g., pacemaker to control the heart and sensors for drug delivery/improved smart manufacturing processes;
- Microbatteries in the current market are low energy based and have short run times;
- Most of the microbatteries in the current market are liquid electrolyte based, not safe, and show capacity or energy in micro-scale ( $\mu\text{Ah}$  or  $\mu\text{Wh}$ );
- No transparent cells in the market, which are suitable for *in situ* medical diagnosis or scanning;
- S- cathodes have capacity, 1675 mAh/g, 5-10 times more than the lithium-ion battery (LIB) cathodes;
- Our Li-S microbattery designs are targeted to show the capacity or energy in milli-scale (mAh or mWh);
- Our Li-S microbattery design is completely solvent and carbon free;
- Our Li-S microbattery is expected to be super safe, since all solid-state design and fabrication;
- Sulfur is cheaper compared conventional LIB cathodes, and easy to recycle;
- With Li-S cells, possible to get more cell energy in a given volume compared to LIBs;
- Microbattery value was marked at USD 326 Million in the year 2022 and is expected to surpass USD 842 Million by the year 2030, registering a CAGR of 20.9%;
- Microbatteries show a positive impact on health, social, and economic changes in the world.



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Total Volume:  $\leq 100\text{mm}^3$   
Cell Capacity:  $\sim 8\text{--}25\text{ mAh}$   
Cell Energy:  $\sim 16\text{--}50\text{ Wh}$   
Flexible S-loading

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