BEYOND LI-ION : RECENT DEVELOPMENTS AND DEEPER UNDERSTANDING OF THE LITHIUM/SULFUR RECHARGEABLE BATTERY TECHNOLOGY.

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Firstly reported in the 80's, rechargeable lithium/sulfur (Li/S) batteries have received ever-increasing attention since 10 years. Indeed, elemental sulfur (S_8) is a promising positive electrode material due to its high theoretical specific capacity of 1675 $mAh.g^{-1}$. Assuming full conversion of S_8 to Li_2S, complete Li/S cells are expected to reach practical gravimetric energy densities from 300 up to 600 $Wh.kg^{-1}$. Those values, combined with low cost, non-toxicity and environmentally abundance of sulfur, make Li/S batteries one of the most promising candidates for next-generation energy storage systems. A review of the recent developments done at CEA-LITEN on the lithium/sulfur cell will be presented, at different levels starting from the optimization of coin cell components up to assembly of prototypes.

In parallel, review of last characterization methods that have been applied via *in situ* and *in operando* methods to the lithium/sulfur (Li/S) battery will be reported, allowing deeper understanding of Li/S cell cycling mechanism.