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Lithium batteries are among the most promising systems for electrochemical energy storage. However, their capacity and cost-efficiency have to be improved for further applications, for instance in electric vehicles.[1] Lithium/organic and lithium/sulfur batteries offer an interesting alternative to the classical Li-ion systems due to their high theoretical specific capacity and potential low cost. However, two major roadblocks currently prevent industrial development of these kind batteries: (i) the progressive dissolution of active material in the electrolyte, which hinders cyclability of the devices and; (ii) the electrical insulating nature of organic or sulfur materials.[2]

Here, we develop a new positive electrode material avoiding the dissolution of the active material in the electrolyte upon cycling, by grafting new diazonium derivatives containing active disulfide groups onto multi-walled carbon nanotubes (MWNTs).[3] The MWNTs insure a well distributed electronic conductivity inside the positive electrode and serve as a support for a covalent immobilization of the thiolated active species. Compared to electrodes formed by simply mixing carbon nanotubes with thiol-containing molecules, covalently functionalized MWNT materials present an excellent stability over prolonged cycling and a promising specific capacity, in the range of 100 $mAh \cdot g_{electrode}^{-1}$, i.e. including carbon and current collector masses.

References

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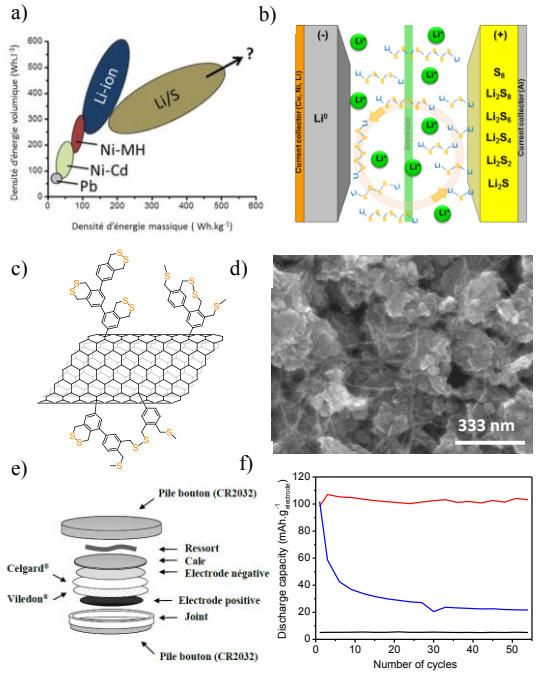

Figure: *a) Comparison of different rechargeable battery technologies, in terms of gravimetric and volumetric energy densities. b) Schematic illustration of the dissolution of lithium polysulfides. c) Representation of functionalized nanotubes. d) SEM micrographs of functionalized nanotubes. e) Schematic representation of coin cells. f) Capacity retention of samples with purified MWNTs (black), MWNTs mixed with the disulfide (blue), MWNTs covalently functionalized with the thiolated molecule (red) used as a positive electrode material.*

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