

Beyond Lithium Ion: Lithium Metal Batteries with High Specific Energy and Long Cycle Life

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The lithium ion battery industry has been rapidly growing and now dominating in many power source sectors such as automotive industries, portable devices, and aerospace applications. Lithium ion batteries currently being implemented in electric vehicle (EV) and hybrid electric vehicle (HEV) are not efficient enough to outperform gas combustion vehicles on the road today, which is limited by the theoretical specific energy of cathode (intercalation oxides) and anode (graphite) materials for lithium ion batteries. The next phase in the advancement of the lithium battery technology relies very much on replacing the intercalation electrodes which has limited theoretical specific capacity. Metallic lithium is a good candidate for the anode, since it has a very high theoretical specific capacity which is more than 10 times than graphite. However, the formation of dendrites affects the charge efficiency of this type of electrode, which can be very dangerous, even fatal at time. In our approach, functionalized carbon black (FCB) coating was implemented onto the separator to eliminate the hazard of dendrite formation. Furthermore, the lithium metal batteries with our technology offered much higher specific energy and power, and improved cycle life.