LITHIUM-METAL BATTERIES

Gradient interface

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Using metallic Li for anodes is widely considered to be one of the most promising approaches for the realisation of next-generation high-energy rechargeable batteries. Recharging a Li-metal battery requires electrodeposition of Li onto the anode and Li dissolution into the electrolyte. In practice, these two processes are not exactly reversible, largely due to undesired reactions between Li and electrolytes, as well as the concurrent formation of Li dendrites caused by non-uniformity of the Li deposition on the anode surface. There have been intensive efforts in tackling such Li anode problems. Now, Liqiang Mai, Yan Zhao, Hao Zhang and colleagues from China develop a gradient anodic layer to facilitate the formation of a robust solid–electrolyte interface (SEI), which could lead to stable and reversible batteries.

The researchers' design is based on layers of zinc oxide (ZnO)/carbon nanotubes (CNT) with different loadings of ZnO, with a final layer of CNTs at the surface of a Li foil electrode. The bottom ZnO/CNT layer is lithiophilic (tending to attract Li ions) and is able to regulate Li deposition so as to ensure a uniform Li morphology on the electrode surface. The top CNT layer is lithiophobic (tending to repel Li ions), preventing the growth of Li from beneath; it is also porous and that means that it can facilitate Li ion transport from the electrolyte. Such a stable and ion-conductive SEI is demonstrated in a symmetric Li foil pouch cell and a Li–S cell in which stable cycling is maintained for more than 200 cycles.

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