

Is high energy surface a reasonable choice for anode free lithium metal batteries?

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The lithium metal battery (LMB) is regarded as a promising post lithium-ion battery. However, it is a major disadvantage that far excess Li metal is added than the practically used Li. This surplus Li lowers the volumetric and gravimetric energy density. In this respect, research on the anode free LMB using only the Li present in cathode without Li metal is in the spotlight. The choice of the current collector is very important for anode free LMB and lithiophilic materials are strong candidates for anode free LMB with high coulombic efficiencies. High energy surface is one of the lithiophilic surface due to its low Li nucleation barrier. However, high energy surfaces tend to easily reduce the electrolytes and electrolyte decomposition happens in higher voltage than Li nucleation. Accordingly, we have to consider the high energy surface in terms of both Li nucleation and electrolyte decomposition. In this paper, we investigated whether the high energy surface is actually suitable for use as a current collector of an anode free LMB and reveal that high energy surface is not proper due to the severe electrolyte decomposition.