Enhanced cycling performance of lithium metal anode by inorganic mechanical protection layer in lithium metal battery

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Lithium metal is the ultimate anode in a lithium secondary battery, because it has high theoretical capacity (3860 mAh /g) and low redox potential (–3.04 V vs SHE). Furthermore, lithium metal anode is indispensable for Li–S and Li–air battery, which are being intensively studied for next-generation battery applications. However, Utilization of lithium metal anode often faces fundamental challenges originating from side reaction of the lithium metal as well as growth of lithium dendrites that reduce performance and safety. Thus, previous workers focus on study to overcoming dendrite growth and safety hazard using additive, gel polymer electrolyte, ceramic coating and surface control. In this study, we demonstrate improvement of the performance of lithium metal anode performance by coating an inorganic material on lithium metal anode. Inorganic coating act as a mechanical protection layer on lithium metal, which has the advantage of suppressing dendrite growth. Not only initial capacity but also cycle stability are enhanced on coated lithium metal anode. The suppressed Li dendrite growth under mechanical protection layer is observed by SEM. As a result, our mechanical protection layer enhanced electrochemical performance of lithium metal battery. Our work shows potential of achieving highly safe lithium metal battery

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