

Effective application of the Highly Concentrated Redox Mediator and Protective Layer on Lithium Metal for Li-O₂ Batteries

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Recently, researches related to redox mediator in electrolyte and protective layer for Li metal have been suggested. However, compared to other battery systems (Li-ion and Li-S batteries), Li-O₂ batteries have extremely low energy efficiency and poor cycle life. Moreover, catalytic effect of redox mediator for oxygen evolution reaction decreased gradually as cycle goes on due to decomposition issue at the Li metal surface. Here we designed the Li-O₂ batteries with concentrated LiBr as a continuously effective redox mediator and graphene-polydopamine composite layer (GPDL) as a stable protective layer for Li metal. Not only as redox mediator but also as lithium salt, LiBr can substitute the typical lithium salt and alleviate the oxygen solubility problem although high concentrated condition (0.5 M) is used. Moreover, as a stable protective layer and host material for Li ion, GPDL can improve the stability and cycle life of Li-O₂ battery remarkably. As a result, high energy efficiency more than 80% are maintained until for 150th cycles. With this study, we confirmed that it is necessary to understand mutual relations between the whole materials to improve the Li-O₂ batteries.