Review

Recent developments of aprotic lithium-oxygen batteries: functional materials determine the electrochemical performance

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Recent developments of aprotic lithium-oxygen batteries: functional materials determine the electrochemical performance

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Abstract

Lithium oxygen battery has the highest theoretical capacity among the rechargeable batteries and it can reform energy storage technology if it comes to commercialization. However, many critical challenges, mainly embody as low charge/discharge round-trip efficiency and poor cycling stability, impede the development of Li-O_2 batteries. The electrolyte decomposition, lithium metal anode corrosion and sluggish oxygen reaction kinetics at cathode are all responsible for poor electrochemical performances. Particularly, the catalytic cathode of Li-O_2 batteries, playing a crucial role to reduce the oxygen during discharging and to decompose discharge products during charging, is regarded as a breakthrough point that has been comprehensive investigated. In this review, the progress and issues of electrolyte, anode and cathode, especially the catalysts used at cathode, are systematically summarized and discussed. Then the perspectives toward the developments of a long life Li-O_2 battery are also presented at last.

Keywords: Li-O_2 battery, Lithium metal anode, OER/ORR catalyst, Hierarchically porous cathode, Parasitic reactions

1. Introduction

Energy storage has become the focus of attention of the world over the past several years as a result of increasing energy demand, combined with the depletion of fossil fuels and the environment pollution of their use. Of the variety of technologies, the state-of-the-art lithium-ion batteries will continuously play an important role in portable electronic devices because of the high energy density.