DESIGN OF LITHIUM AIR BATTERIES WITH AQUEOUS ELECTROLYTE

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ABSTRACT

Aqueous lithium-air batteries (LABs) show a great promise as energy storage devices due to their high energy densities. However, there are currently numerous scientific and technical challenges that must be addressed before being practical applications. The main components of an aqueous LAB include air cathode, aqueous electrolyte, protect Li anode with lithium-ion-conducting ceramic. In order to obtain better battery performance, it is necessary to optimize or modify the air cathode structure, catholyte composition, and lithium ion conducting glassy ceramic.

The air cathode for hybrid LABs is multifunctional and a thin transition layer with carbon nanofiber (CNF) decorated with 30 w.% Teflon (PTFE) particles is the best in the balance of minimizing the water vapor diffusion from the LABs and improving the battery discharge performance. The catholyte pH is preferred less than 3 or higher than 12 to ensure stable and more efficient battery discharge performance. The addition a layer of lithiated nafion thin film (~6 μm) is effective to increase the lifespan of the protect lithium anode in acidic electrolyte, thus the operational life of LABs could be extended.