A Horizontal Three-Electrode Structure for Zinc-Air Batteries with Long-Term Cycle Life and High Performance

Weichen Hong¹, Hui Li², Baoguo Wang^{1,*}

¹ Department of Chemical Engineering, Tsinghua University, Beijing 100084, China

² South University of Science and Technology of China, Shenzhen, Guangdong, 518055, China

*E-mail: bgwang@tsinghua.edu.cn.

doi: 10.20964/110384

Received: 19 January 2016 / Accepted: 25 February 2016 / Published: 1 April 2016

Limited cycle life is a main reason preventing the large-scale application of electrically rechargeable zinc-air batteries. With the aim of increasing cycle life, a novel three-electrode zinc-air battery in a sandwich arrangement was designed and fabricated. The cycle life was evaluated by charge-discharge cycling tests with 100 cycles at high operational current density (40 mA cm^{-2} and 80 mA cm^{-2} for charging and discharging, respectively) for performance testing. A maximum power density of 105 mW cm^{-2} was achieved at current density of 150 mA cm^{-2} . The average columbic efficiency, depth of discharge and energy efficiency were 90%, 73% and 42%, respectively. A longer cycling test for 1000 cycles approximately 1917h cycling duration at a current density of 20 mA cm^{-2} was also achieved and voltage decay for charging and discharging was 13% and 12%, respectively. The results demonstrate that a horizontal tri-electrode structure for zinc-air batteries is advantageous for achieving increased cycle life while exhibiting high power density, high depth of discharge and excellent charge-discharge cycling performance, which provide promising applications of zinc-air batteries for electric vehicle and grid-scale energy storage.

Keywords: Zinc-air batteries, Three-electrode, Horizontal placement, Cycle life

[FULL TEXT](#)

© 2016 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).