Modelling Discharge Performance of Non-aqueous Lithium-Air Batteries with Hierarchical Cathode

Kai Jiang[a], Xunliang Liu[a,b] *, Ruifeng Dou[a,b], Wenning Zhou[a,b]
[a] *School of Energy and Environmental Engineering, University of Science and Technology Beijing, Beijing 100083, China*
[b] *Beijing Engineering Research Center for Energy Saving and Environmental Protection, University of Science and Technology Beijing, Beijing 100083*

E-mail: liuxl@me.ustb.edu.cn

Abstract: In order to investigate the influence of the electrode structure on the discharge performance of non-aqueous lithium-air battery, a one-dimensional model was developed for the discharge of a non-aqueous lithium air battery with hierarchal porous carbon cathode. In this model, lithium peroxide (Li_2O_2) is only considered as the discharge product and assumed to be attached to the surface of active sites, changing the electrode porosity and active surface area. The continuous formation of lithium peroxide eventually leads to the end of the battery discharge. The model predictions suggest that the hierarchical cathode with varied porosity can improve the battery specific capacity. In addition, the variation trends of the cathode porosity, Li^+ and oxygen concentration, active specific surface and the distribution of discharge product during discharge were obtained.

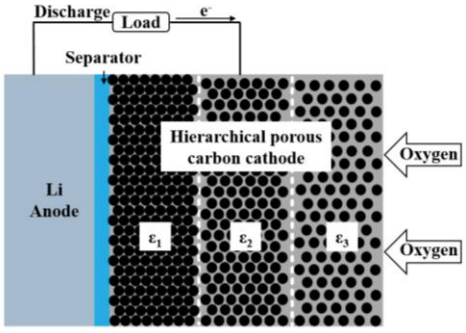

Fig.1. Schematic diagram of a lithium-air battery with hierarchical cathode.

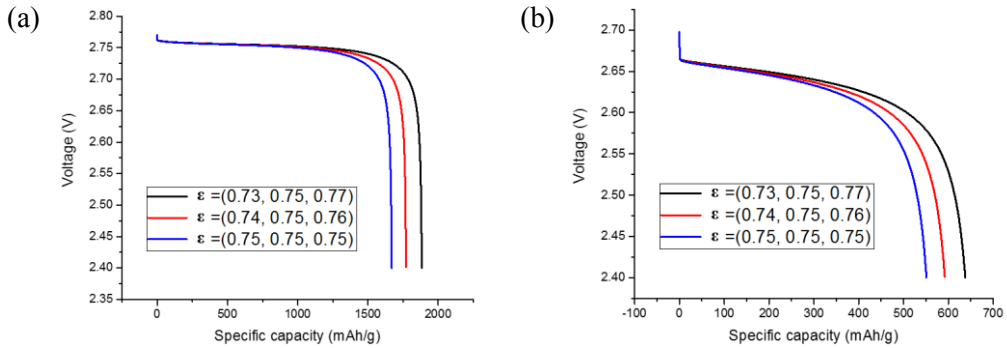

Fig.2. Voltage-capacity curve on discharge with different hierarchical cathode. Discharge current density: (a) 0.05mA/cm^2, (b) 0.20mA/cm^2.

References:

[1] Sahapatsombut, Ukrit, C. Hua, and K. Scott. Journal of Power Sources 227.4 2013:243-253. Reference to a journal.