第353回触媒化学研究センターコロキウム

共催　電気化学会北海道支部

Nanoscience for Lithium-Oxygen Batteries

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A high demand for the future energy storage applications in electric vehicles (EVs) and grid storage has been driving rapid growth of battery research. In particular, as the current battery technology has almost reached its performance limitation, new battery systems have been extensively investigated to achieve higher energy density. In this context, a lithium-oxygen ($Li–O_2$) battery has held promise on account for high theoretical energy density (over 3 kWh/kg). However, its development progress has been slow and left the $Li–O_2$ battery still in the demonstration level due to poor cycling stability and high cathodic polarization. To mitigate these performance degradations, the scientific scrutiny to understand true electrochemical reactions in the $Li–O_2$ batteries in conjunction with alleviation of parasitic side reactions has been urgently needed. In this seminar, I present recent research progress of Li–O2 batteries from Byon group. We observe $Li–O_2$ electrochemical reaction ($2Li^+ + O_2(g) + 2e^- \leftrightarrow Li_2O_2(s)$) using in situ imaging probe (AFM), and evaluate reaction efficiency using realtime monitoring of XRD and differential electrochemical mass spectroscopy (DEMS). These fundamental studies provide the evidence of dynamic Li_2O_2 formation and decomposition, accompanied by parasitic side reactions. Based on the insights obtained from these approaches, we can improve the $Li–O_2$ cell performance via engineering of Li_2O_2 structure and eliminating of side products. The promising metal oxide nanostructures incorporated into carbon nanotube cathode promote smooth decomposition of Li_2O_2 and side products during charge, which greatly lower charge potential and enhance cycling performance, respectively

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