学術講演会のお知らせ

In situ Raman Spectroscopy and EQCM Studies of Lithium-Sulfur Batteries

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共催：電気化学会北海道支部

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場所：北海道大学・創成科学研究機構棟（三階セミナー室**D, 03-215**）

講演内容：

In this talk, *in situ* Raman spectroscopy and electrochemical quartz crystal microbalance (EQCM) measurements were used to investigate the mechanism of sulfur reduction in lithium-sulfur battery slurry cathodes. Raman spectroscopy shows that long chain polysulfides (S_8^{2-}) were formed via S8 ring opening in the first reduction process at ~2.4 V vs Li/Li^+ and short chain polysulfides such as S_4^{2-}, S_4^{-}, $S_3^{\bullet-}$ and $S_2O_4^{2-}$ were observed with continued discharge at ~2.3 V vs Li/Li^+ in the second reduction process. These polysulfides are all reversible during charge process. Rate constants obtained for the appearance and disappearance polysulfide species show that short chain polysulfides are directly formed from S_8 decomposition. The rate constants for S_8 reappearance and polysulfide disappearance on charge were likewise similar, suggesting that polysulfide oxidation and reduction is quasi-reversible.

In situ EQCM results show that the sulfur-carbon cathode gains Sauerbray-mass during the first discharge plateau. The crystal resistance (Rc) was used to monitor the viscosity and density of the polysulfides in contact with electrode as well as the change of electrode surface. The change in Rc after first discharge plateau suggests that the Sauerbray equation is no longer valid and that the porosity of sulfur-carbon cathode increases particularly in the lower potential region (e.g. 1.5 V).

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