Mechanistic Investigation for the Rechargeable Li-Sulfur Batteries

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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Technical Approach:

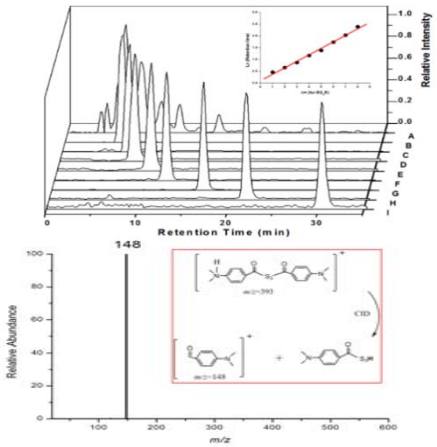
- Using in-situ electrochemical-MS, electrochemical-HPLC/MS, electrochemical-UV/Vis, XPS, SEM and XRD to study electrochemical reactions associated with sulfur electrodes.
- Using electrochemical techniques such as AC impedance, rotation ring disk electrode, galvanostat, etc. to study the electrode process kinetics

Status:

- Completed the development of HPLC-MS essay for polysulfide determination.

Technology:

Develop and conduct *in-situ* HPLC-MS-Electrochemical technique to qualitatively and qualitatively investigate the change of polysulfide during the charge and discharge of Li-S batteries.



Objectives:

- Fundamental research on the mechanism for Li-S batteries, investigate the kinetics for the sulfur redox reaction, develop electrolyte and additive to increase the solubility of Li2S and optimize the sulfur electrode design.

Deliverables: Complete and report the studies of the quantitative and qualitative determination of dissolved sulfur and polysulfide ions in the electrolyte of Li-S batteries.

Funding:

— Duration one year from October 1, 2015

— Total - $300,000.00 DOE - $300,000.00

Milestones:

- Q1 Milestone: Complete literature review and feasibility study of the methods for polysulfide determination.
- Q2 Milestone: Complete the development of the essay to determine all polysulfide ions.
- Q3 Milestone: Complete the design, qualification for an in-situ electrochemical HPLC-MS cell for Li-S investigation.
- Q4 Milestone: Complete the identification of polysulfide ions formed from elemental sulfur.
- Annual Milestone: Complete the development of an analytical method for the quantitative and qualitative determination of all polysulfide ions in non-aqueous electrolytes and the initial design of an in-situ electrochemical study for the sulfur reduction reaction.