Development of Lithium-Organic Redox Flow Battery

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Redox flow batteries (RFBs) have attracted considerable research interests primarily due to their ability to store large amount of power and energy, up to multi-MW and –MWh, respectively.1 Traditional aqueous RFBs however are generally low energy density systems limited by water electrolysis potential window and active materials' concentrations. In this regard, a nonaqueous RFB system is attractive because it offers the expansion of the operating potential window, which has a direct impact on the system energy and power densities.

Here we report the development of nonaqueous Li-organic redox flow battery (LORFB) based on a modified redox active organic molecule as the positive electrolyte and lithium metal as the negative electrode.[2] Molecular modification of quinone-based and ferrocene-based organic materials have demonstrated significantly improved solubility in common organic solvent, enabling the organic molecules to function as energy bearing active materials in the positive electrolyte. The synthesis and the electrochemical study of the two organic materials and the performance of the noanaqeuous flow cell using the modified organic redox couple as positive electrolyte will be reported.

Reference

1. W. Wang, Q. Luo, B. Li, X. Wei, L. Li and Z. Yang, *Advanced Functional Materials*, 2013, **23**, 970-986.
2. W. Wang, W. Xu, L. Cosimbescu, D. Choi, L. Li and Z. Yang, *Chem Commun*, 2012, **48**, 6669-6671.

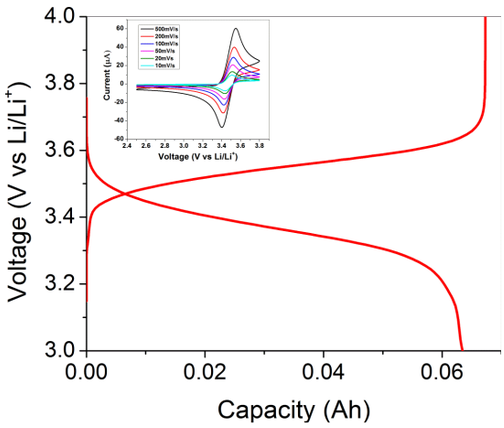

Figure 1. Flow cell voltage profile and CV study. The flow cell uses Li/Li^+ as anode at $2mA/cm^2$ current density and 40mL/min flow rate.

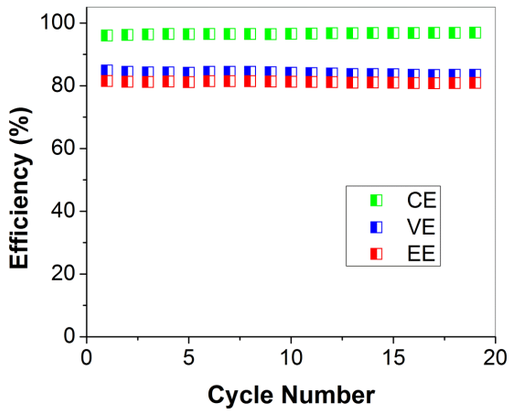

Figure 1. Flow cell cycling using Li/Li^+ as anode at $2mA/cm^2$ current density and 40mL/min flow rate.