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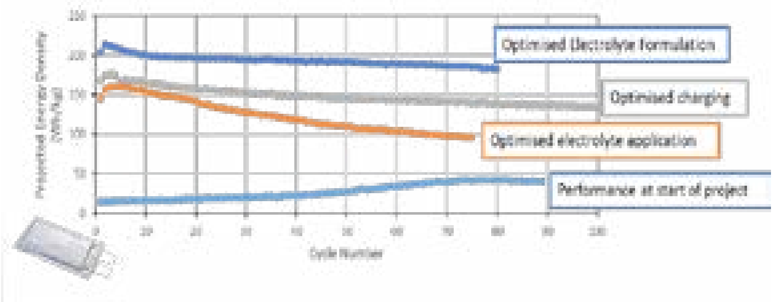
Microgrid energy storage using Lithium-Sulfur Batteries: Feasibility of solvent-in-salt electrolytes

Ashley Brew
OXIS Energy Ltd, UK

Lithium-Sulfur (Li-S) batteries are considered one of the most promising technologies that could provide a generational leap in terms of energy density over current lithium ion batteries. OXIS Energy have demonstrated this by succeeding in developing Li-S batteries at 400Wh/kg. However, capacity fade at such high energy density is rapid and further research and development is needed to alleviate this. Many factors contribute to capacity fade in Li-S batteries: for example, dissolution and loss of cathode material, consumption of the electrolyte due to its reaction with lithium metal and electrical isolation of insulating sulfur and Li2S charge and discharge products. Another major issue in Li-S batteries is the 'polysulfide shuttle', in which reaction intermediates shuttle between the cathode and anode during charge.

So-called solvent-in-salt (SIS) electrolytes are those in which the salt exceeds the solvent either by weight, by volume, or both. These unique electrolytes have demonstrated interesting properties in the literature and may solve many of the problems outlined above. SIS electrolytes inhibit intermediate dissolution due to the common ion effect, thus reducing active material loss and inhibiting the polysulfide shuttle. SIS electrolytes have also demonstrated improved lithium plating due to the high lithium-ion transference number, leading to lower rates of electrolyte depletion. These combinations of factors have resulted in these electrolytes exhibiting excellent cycle stability and coulombic efficiency in literature studies.

Here we will present our work developing this type of electrolyte for R&D pouch cells and their possible use in microgrid energy storage applications.



Biography

Ashley Brew gained his MSc in Catalysis and PhD in Electrocatalysis from Cardiff University, specializing in the oxygen reduction reaction in fuel cells. After a few post-doctoral positions in the fields of EPR spectroscopy and thermoelectric materials, he now works at OXIS Energy, a leading developer of lithium-sulfur battery chemistry. As a research scientist at OXIS, Ashley is a member of the electrolyte research group and is currently nearing the end of a 12-month project that aims to establish the feasibility of novel electrolytes for microgrid applications. OXIS Energy also develop lithium-sulfur secondary batteries for several other applications, including automotive and aerospace.

ashley.brew@oxisenergy.com

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