LiS battery with low solvating electrolyte

FIELD OF THE INVENTION

The present invention relates to a lithium sulfur (LiS) battery with a sparingly solvating electrolyte.

BACKGROUND OF THE INVENTION

For lithium sulfur (LiS) battery cells with liquid, it is a common approach to use electrolytes in which a large fraction of the electrochemically active sulfur, especially polysulfides, is dissolved in the electrolyte.

Examples are disclosed in US7354680 assigned to Sion Power, in particular disclosing electrolytes comprising an cyclic ether, for example 1,3-dioxolane (DOL, $C_3H_60_2$), and a acyclic ether, for example dimethoxyethane (DME), as well as lithium salts, for example $LiN(CF_3S0_2)_2$ (Bis(trifluoromethane)sulfonimide lithium salt) which is also called LiTFSI. In addition, the electrolyte contains lithium nitrate $LiNO_3$ as an additive. The latter additive is generally regarded as preventing quick reduced performance of the battery by migration of polysulfides. However, creation of gases is one of the problems of this technology.

Alternative approaches include low-solvating electrolytes, in which the electrochemically active sulfur is only sparingly dissolved. In the general art of electrolytes for batteries, the term "low solvating" is used alongside the term "sparingly solvating" for those electrolytes that do only dissolved a low amount of the available polysulfides.

As there is no need for a high volume to dissolve the polysulfides, lower amounts of electrolyte can be used, which in turn reduces the overall weight of the cell and has therefore potential for increasing the energy density correspondingly.

This subject is discussed in the article "Sparingly Solvating Electrolytes for High Energy Density Lithium—Sulfur Batteries", which is published by Cheng, Curtiss,