**Non-Confidential Description - PSU No. 3995**
“Polysulfide Electrolyte for Li-Sulfur Battery”

**Keywords:**
Li-S battery, electrolyte, lithium ion battery

**Links:**
Inventor Website  
Published Patent Application

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**Background**
After decades of development, the lithium ion battery has been reaching its energy density limit. To meet the long term requirement for application in large-scale energy storage or electric vehicles, the exploration of new electrochemistry and new materials for high energy battery systems is needed. Rechargeable Li-S batteries are promising candidates because sulfur has a high theoretical specific capacity and a high specific energy. However, there are limits on Li-S batteries including low sulfur utilization, fast capacity fading, and safety concerns. Therefore there is a need to develop high performance Li-S batteries that overcomes these challenges.

**Invention Description**
The invention is a simple strategy for a high performance Li-S battery by using soluble polysulfide containing ether-based electrolytes. This new Li-S battery combines a conventional carbon/sulfur cathode with a liquid electrolyte-containing electrochemically active material. Sufficient concentration of active sulfur and electrolytes avoids the formation of insoluble Li$_2$S during discharge. Results show that adding polysulfide not only boosts the cell capacity, but also improves the cyclability and rate capacity of the cell.

**Advantages/Applications**
- Improves cell capacity, cyclability, and rate capacity
- Avoids formation of insoluble Li$_2$S during discharge
- Contains ether-based electrolytes