

Materials Poster Abstract**Application of Poly(3,4-ethylenedioxythiophene) Polystyrene Sulfonate (PEDOT-PSS) to Cathode for Improvement of Charge-discharge Property of Lithium Sulfur Battery**Hiroki Nara¹, Tokihiko Yokoshima¹, Takayuki Noguchi², Toshiyuki Momma^{1,2}, Tetsuya Osaka^{1,2}¹ Research Organization for Nano & Life Innovation, Waseda University² Graduate School of Advanced Science and Engineering, Waseda University

Sulfur cathode has a critical problem of dissolution of the polysulfide ion (S_x^{2-}) into the electrolyte. To date, we have reported a polypyrrole thin film containing ionic liquid on a sulfur/Ketjenblack (S/KB) composite electrode by electropolymerization method. The polypyrrole film can permeate Li ions (Li^+) while suppressing S_x^{2-} permeation.^{1,2} In addition, to simplify a structure and a preparation process of a sulfur cathode, we have investigated mixing S/KB and cation-exchange polymers (CEPs) instead of the electropolymerization of polypyrrole on S/KB cathode. In the present paper, improvement of charge-discharge properties of lithium sulfur secondary batteries using various CEPs, especially poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT-PSS), is discussed.

Compared with S/KB cathode, S/KB/CEP composite cathodes demonstrated an improvement in charge-discharge efficiency even in the electrolyte of 1M lithium bis(trifluoro methanesulfonyl)amide (LiTFSa) in 1,2-Dimethoxyethane (DME)/1,3-dioxolane (DOL)(1 : 1, vol%), where S_x^{2-} are easily dissolved. Figure 1 shows the improvement of charge-discharge efficiency in the case of PEDOT-PSS and the effect of mix ratio of S/KB and PEDOT-PSS. The S/KB/CEP composite cathode of S/KB:PEDOT-PSS = 90:10 wt.% showed the highest specific capacity with high charge-discharge efficiency. The reason of the optimized mix ratio will be discussed.

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References

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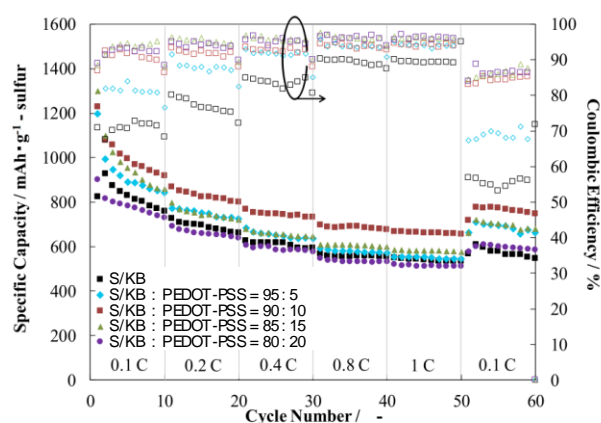


Fig.1. Rate properties of S/KB and S/KB/PEDOT-PSS cathodes, which are prepared by mixing with Polyvinylidene difluoride (PVdF) binder. These are measured by using 2032 coin-type cell using Li foil anode and an electrolyte of 1M LiTFSa/DME-DOL (1:1, vol%) in the voltage window of 1.5 V – 3.0 V.