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ACCEPTED MANUSCRIPT

Synthesis of a polyacrylonitrile/tetrachloro-1,4-benzoquinone gel polymer electrolyte for high-performance Li-air batteries

Young Bok Kim, Il To Kim, Myeong Jun Song, Moo Whan Shin*

School of Integrated Technology, Yonsei University, Yonsei Institute of Convergence Technology, 162-1, Songdo-dong, Yeonsu-gu, Incheon, 406-840, Korea

*Corresponding author, Tel: +82-32-749-5839; fax: +82-818-5801, *E-mail: mwshin@yonsei.ac.kr

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Abstract

Gel polymer electrolyte (GPE) is recently attracting a significant attention for lithium air batteries (LABs) due to better reliability compared with liquid type electrolyte and higher ionic conductivity compared with solid type electrolyte. In this paper, we report a new combination of polyacrylonitrile (PAN)-based GPE with tetrachloro-1,4-benzoquinone (tCl-pBQ) as the redox mediator for the LAB application. The synthesized PAN/tCl-pBQ GPE with lithium bis (tri-fluoro-methane-sulfonyl)imide (LiTFSI)/tetraethylene glycol dimethyl ether (TEGDME) displays a decrease in the LAB charge voltage from ~4.2 to 3.6 V and a ~10 % increase in energy cycle efficiency compared with PAN GPE without tCl-pBQ. The decrease in charge voltage improves the cyclability from 8 to 98 cycles. Structural analyses reveal that addition of tCl-pBQ accelerates the formation of an amorphous phase in the PAN-based gel polymer electrolyte matrix, improving the ionic conductivity from 7.64 to 12.5 mS cm^{-1} at room

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