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Optimizing solid electrolyte interphase on graphite anode by adjusting the electrolyte solution structure with ionic liquid

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Abstract N-allyl-N-methylpiperidinium bis(trifuoromethansulfonyl)imide ($PP_{13*}TFSI$) ionic liquid was adopted as a solute replacing partial of lithium salt in a concentrated propylene carbonate (PC) electrolyte. Varying the concentration of $PP_{13*}TFSI$ ionic liquid can change the electrolyte solution structure and thus optimize the solid electrolyte interphase (SEI) on the graphite anode. The number of PC molecules coordinated with lithium ion is significantly altered and this results in a change of the SEI mechanism at the electrode/electrolyte interface. At an optimum molar ratio of 2:1 between LiTFSI and $PP_{13*}TFSI$, the first coulombic efficiency and the cycling capability of the graphite anode are significantly improved. Fourier transform infrared spectroscopy (FTIR) verified the SEI mechanism change from two-electron reduction to one-electron reduction in the presence of $PP_{13*}TFSI$ ionic liquid. SEM

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