

# Single lithium molten salt based on fluorosulfonyl(trifluoromethylsulfonyl)amide as a real zero-solvent electrolyte for lithium battery system

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Ionic liquids (ILs) composed of low-coordinating perfluoroanions such as bis(trifluoromethylsulfonyl)imide have been reported as a unique electrolyte for lithium secondary batteries for almost past two decades due to their unique properties such as less-flammability. We have been prepared various perfluoroimides and also perfluoroalkylperfluoroborate to improve performance of lithium secondary battery with using only ILs. During these studies, various unique electrolytes have been found such as organic ionic plastic crystals (OIPCs) and low temperature lithium molten salt, which are classified as “zero-solvent” as with ILs. [1]

Recently, super concentrated electrolytes have been attracted much attention as a novel electrolyte for a lithium battery system. [2]. In our group, we have also investigated pure ionic liquids systems, which have been intensively studied for battery applications for past two decade by various researchers [1]. These two indeed exhibited unique properties compared with a conventional organic electrolyte and these properties might be caused by a perfluoroanions such as a bis(trifluoromethylsulfonyl)imide. [2-3] However, both still contains unnecessary moieties such as organic molecules and onium cations in super concentrated electrolytes and ionic liquids, respectively. On the other hand, we also reported that a single lithium molten amide such as lithium fluorosulfonyl(trifluorosulfonyl)imide melts ca. 373 K and  $\text{LiFePO}_4$  could be well operated in the melt. [4]

Here, we would like to discuss how anionic species such as imide anions are important to control not only the physical properties of lithium salts but also the battery performance using various unique electrolyte containing the imide anions.

## References:

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