In the present work, we report recent progresses on lithium salts based on various kinds of perfluorinated sulfonimide anions (see Figure 1) as conducting salt for Li and/or Li-ion batteries. We will cover a wide range of electrolytes of these new anions from non-aqueous liquid (including conventional carbonate solutions, ionic liquids, and molten salts) to solid polymer electrolytes (including classic lithium salt/PEO, and single Li-ion conducting polymer based on polyanions).

In liquid carbonate electrolytes, both LiFSI and LiFNFSI as conducting salt or additive for improving the high-temperature performances of Li-ion cells will be discussed. In both ionic liquid and molten salt electrolytes, the electrochemical performances of natural graphite/LiFePO4 Li-ion cells will be detailed. In solid polymer electrolytes, the electrochemical performances of Li/LiFePO4 cells will be described. The mechanisms behind the improvements of electrochemical performances of Li and Li-ion cells by using these lithium salts will be discussed, in terms of various chemical, electrochemical and surface analyses.

Figure 1. Structures of various kinds of perfluorinated sulfonimide anions.