Electrochemical Properties of Ionic Liquid Gel Formed by Semi-perfluoroalkyl Benzoate Derivatives

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In our previous works, it was found that some low molecular weight compounds containing perfluoroalkyl group gelated various organic solvents and ionic liquids. While relationship between gelation mechanism and molecular structures was not elucidated.

In this study, compounds **1** and **2** (Fig. 1) were synthesized and examined gelation abilities in various organic solvents and ionic liquids. Furthermore, electrochemical properties of ionic liquid gels so that electrolyte solutions for Li-ion battery substituted to ionic liquid gel electrolytes formed by compounds **1** and **2**.

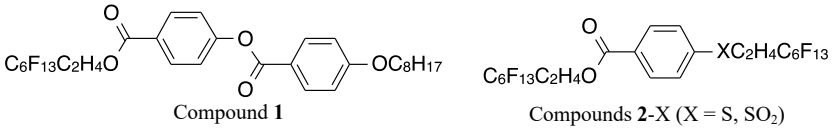

Fig. 1 Chemical structures of compounds **1** and **2**

Compounds **1** and **2**-SO_2 were able to gelate propylene carbonate (PC) and 1M $LiClO_4$ / PC in an amount of 2wt% or less. Furthermore, compound **2**-SO_2 was also able to gelate [EMIM][FSA] and 1 mol kg^{-1} LiFSA / [EMIM][FSA] in an amount of 3wt%. On the other hand, compound **2**-S was unable to gelate PC and [EMIM][FSA] with or without Li^+.

In addition, sol-gel transition temperature ($T_{gel\text{-}sol}$) of 5wt% gels with Li^+ were 20℃ higher than that of gels without Li^+ so that solubility decreased by solvation to Li^+ (Fig. 2).

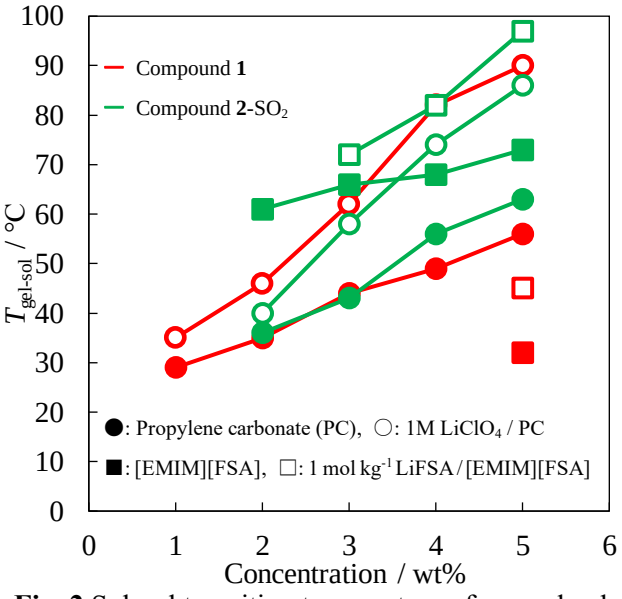

Fig. 2 Sol-gel transition temperature of several gels

In this presentation, electrochemical properties of 1 mol kg^{-1} LiFSA / [EMIM][FSA] gels formed by compounds **1** and **2** will be reported.

Ref: A. Ohashi *et. al.*, *Chem. Lett.*, **47**, 810 (2018), T. Sugimoto *et. al.*, *J .Power Sources*, **183**, 436 (2008).