

High conductivity solvates with unsymmetrical glymes as new electrolytes

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Abstract

A designed custom glyme ether with unsymmetrical (ethyl and butyl) end groups (UG) have been shown to give highly conducting liquid solvate electrolytes. Solvates prepared with UG glyme: salt ratio of 1:1, 2:1 and 3:1 using Lithium bis(trifluoromethane sulfonyl) imide (LiTFSI) and Lithium bis(fluoro sulfonyl) imide (LiFSI) lithium salts have been characterized with emphasis on the 2:1 composition. Conductivity in the order of 10⁻³ S/cm was observed at RT with an electrochemical stability window of 4.5 V. DSC studies indicate a low crystallisation temperature between -60°C and -75°C for LiFSI based solvate electrolyte. Galvanostatic cycling studies (C/10) with LiFePO₄ electrodes indicate a capacity deliverance of 145mAh/g and good C-rate capability up to 2C at RT. Preliminary tests using unsymmetrical glyme-based solvate electrolytes with sulphur and LiNi_{1/3}Mn_{1/3}Co_{1/3}O₂ (NMC) electrodes reveal a low degree of polysulphide dissolution with sulphur electrodes and stable voltage profiles with NMC electrodes suggesting the use of these electrolytes for Li/S batteries and high-voltage Li-ion batteries.