Leire Zubizarreta, Organic Chem Curr Res 2020, Volume 09

Effect of NASICON/Pvdf based Hybrid Solid Electrolyte Composition on the Electrode/ Electrolyte Interface Properties of Solid-State Lithium Batteries

Leire Zubizarreta
Instituto Tecnologico de la Energia (ITE), Spain

Massive research activities have been initiated in order to solve different issues of solid state batteries, specially centred in solid electrolyte development. However, in spite of the good performance of solid electrolyte as such the interfacial contact of solid electrolyte with the electrode active materials is a serious challenge. Important parameters are based on interface impedance and electrochemical and mechanical stability with electrode materials. In order to guarantee an acceptable lifetime and cycling stability of solid batteries, stable interfaces with high contact area are required between electrolytes and active materials. Among this, the mechanical stability of the cell components and interfaces represents a serious challenge for the lifetime of solid batteries. The low elasticity of some ceramic electrolyte materials, in particular oxide electrolytes may not allow for external pressing. Differently, the easily processable polymer electrolytes are already applied with success in lithium metal batteries but must operate at elevated temperatures (above 60 °C) due to ionic conductivity limitations. The development of hybrid electrolytes comprising ceramics and polymers might be the ultimate solution to achieve the required interfacial properties in solid-state batteries.

In this study, the effect of composition of NASICON/PVdF based hybrid solid electrolyte on graphite electrode/solid electrolyte has been studied. For that, different solutions containing different NASICON/PVdF ratio has been prepared and deposited over graphite electrodes by casting method. The electrode/solid electrolyte interfacial properties have been characterized using electrochemical techniques such as linear sweep voltammetry for the determination of electrochemical stability at the interface and electrochemical impedance spectroscopy for the determination of interfacial resistance. The results obtained show that, the combination of ceramic type electrolytes with PVdF-HFP based polymer electrolyte could be a promising alternative to achieve balance properties at interface by improved ionic conductivity given by ceramic electrolyte and better mechanical stability given by polymer electrolytes.

Recent Publications

1. Schnell J, Günther T, Knoche T, Vieider C; Köhler L, Alexander J, Keller M, Passerini D, Reinhart G, (2018) Journal of Power Sources, 382: 160-175
2. Shicheng Y, Schmohl S, Liu Z, Hoffmeyer M, Schön N, Hausen F, Tempel H, Kungl H, Wiemhöfer H, Rüdiger A, (2019) Journal of Materials Chemistry A, 7:3882-3894
3. Liu Q, Liu Y, Jiao X, Song Z, Sadd M, Xu X, Matic A, Xiong S, Song J, (2019)Energy Storage Materials , 23: 105-111
4. Bonizzoni S, Ferrara C, Berbenni V, Anselmi-Tamburini U, Mustarelli P, Teadi C (2019) Phys.chem. chem. Phys. 21:6142-6149
5. Yu X, Manthiram A (2018) 11:527-543

Biography

Leire Zubizarreta Sáenz de Zaitegui is bachelor in Chemistry by the University of Basque Country in 2004. PhD in Chemistry by the University of Oviedo in 2009. She carried out the PhD thesis in INCAR-CSIC research center in Oviedo. During this period, she participated in different national research projects related with materials for energy storage applications and made different stays in the Laboratoire de Gènie Quimique et de Gènie Carboquimique of the University of Liege. In 2009, she joined the Energy Technological Institute where she is involved in the research and development of carbon and polymeric materials for their application in batteries and supercapacitors. Participation in SOMABAT project in the 7FP Green Cars call, with the development of polymer electrolyte membranes. Author and co-author of more than 20 contributions in recognised international journals and author of two patents related to materials for energy applications.

Notes: