Hybrid Organic-Inorganic Gel Polymer Electrolytes for Lithium Batteries

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Hybridization of organic and inorganic materials is a way to produce polymeric compounds having enhanced mechanical and thermal properties. Solvay proprietary functionalized PVDF is able to be linked to silica through i.e. sol-gel reaction. This approach has been selected, in combination with the use of several liquid electrolyte, notably ionic liquids and organic carbonates, to produce a safe gel polymer separator for lithium ion and lithium metal batteries.

The Ionobrid membrane, obtained combining N-Propyl-N-methylpyrrolidinium bis(trifluoromethanesulfonyl)imide (Pyr13TFSI), LiTFSI, tetraethyl orthosilicate and Solef® functionalized PVDF, exhibits homogeneous surface with no defects (Fig.1), while high ionic conductivity (Fig.2), high flexibility and good mechanical strength can be obtained and tuned by adjusting the formulation. The Ionobrid has been successfully tested in lithium batteries and results will be presented.

A comparative study with carbonate based films will be done, focusing on the similarities and differences in term of cyclability and physico-chemical properties of the hybrid networks.

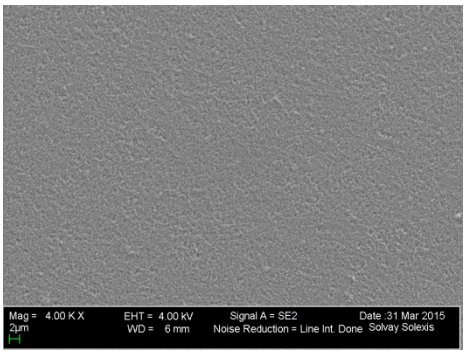

Fig.1: SEM image of Ionobrid membrane (magnification 4.0k)

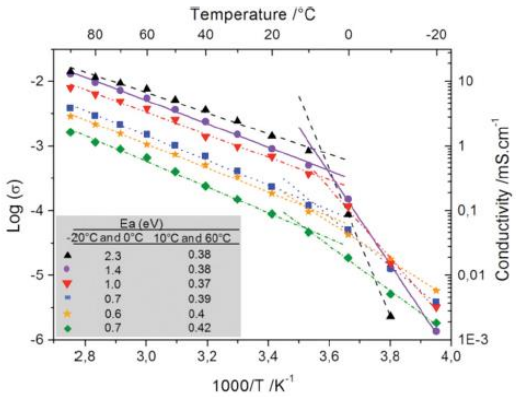

Figure 2. Ionic conductivities of different Ionobrid membrane compositions.

[1] Guyomard-Lack, A., Abusleme, J., Soudan, P., Lestriez, B., Guyomard, D., Le Bideau, J. Adv. Energy Mater., 4 (2014) 1301570.
[2] Kalhoff J., Eshetu GG., Bresser D., Passerini S., ChemSusChem 13 (2015) 2154-75.