Confined ionic liquids within polymeric or hybrid polymer-silica host networks: systematic study of the effect of pore or mesh size

AUTHORS
Jean LE BIDEAU / INSTITUT DES MATERIAUX JEAN ROUXEL (IMN) - UNIVERS, 2 RUE DE LA HOUSSENIERE - BP 32229, NANTES CEDEX 3

PURPOSE OF THE ABSTRACT
Ionogels represent one route for exploiting the considerable potential of ionic liquids (ILs, with or without added salt) applied to all-solid devices. (1) The confinement of ILs within host networks gives solids with striking behaviours. Confining ILs within some host networks can enhance ILs macroscopic fragility, resulting in improved conductivity. Fragility, short relaxation times, low viscosity, and good ionic conductivity are all related to the IL/SiO2 interface, and ratio between number of confined species and pore or mesh size. (2) The presence of ILs at host matrix interface neighborhood leads locally to the breakdown of aggregated, structured regions that are found systematically in bulk ILs and may lead to a segregation of specific ions at the interface. This makes these materials very competitive solid electrolytes, since providing lower density and viscosity of ILs, enhancing their conductivity. Dynamics and conductivity of confined ILs remains very close to that of bulk ILs. Host matrices can range from fully inorganic to hybrid, (bio)polymeric, organic-inorganic matrices. Herein we will present a transversal study of several types of ionogels, showing their common features. Although the range of devices with such membranes is broad, application to supercapacitors and lithium batteries will be presented, with high response rates for the first one and high cyclability for the second one. (3)

References:
(1) Ionic liquid gel materials: applications in green and sustainable chemistry, P. C. Marr & A. C. Marr, Green Chem., 18 (2016) 105-128