

Cation-gelator interaction at the liquid-solid interface in aqueous and non-aqueous low molecular weight ionogels.

Michał Bielejewski, Adam Rachocki and Jadwiga Tritt-Goc

*Institute of Molecular Physics, Polish Academy of Sciences
ul. M. Smoluchowskiego 17, 60-179 Poznań*

Supramolecular ionic gels based on low molecular weight gelators constitute a new class of functional conducting materials. Characterized with high conductivity and thermally reversible gelation process can be created either with aqueous or non-aqueous solutions of different salts. In this way we gain a route to create different organic ionic gel (OIG) electrolyte systems that can serve for basic studies to get known the mechanisms underlying its superb properties, or to create variety of systems with targeted properties important from application point of view. The functionality of OIGs arises from the non-covalent intermolecular interactions, like: H-bonding, Van der Waals interactions, π - π stacking, electrostatic, etc. acting as the driving forces for thermally reversible solidification of electrolytes. To understand and to predict the properties of these systems it is important to get the knowledge about the interactions and dynamics on the molecular level between the solid gelator matrix and the electrolyte solution. On the basis of our previous studies [1,2], we conclude that the enhanced conductivity of the gel phase has its origin in the interactions between the gelator matrix surface and ions. This interaction leads to creation of a thin layer near the matrix surface in which we can observe an enhanced diffusion of the ions. This enhancement in our opinion is due to change of the 3D "bulk" diffusion to 2D "surface" diffusion type. To proof this assumption the FFC relaxometry and PFG NMR diffusometry measurements were performed on quaternary ammonium salt electrolyte and its ionogels in the function of molar concentration of the salt. To determine the mechanisms and factors that defines the conductivity values of OIGs two solvents with different viscosity values were used to prepare the electrolyte solution. Additionally the influence of the cation size on the stability and overall performance of created ionogels was studied. The conductive properties were examined with the use of thermal scanning conductometry (TSC) method [3].

Acknowledgements

The partial financial support for this work was provided by the National Center for Science as grant no. DEC-2013/11/D/ST3/02694.

References

- [1] M. Bielejewski, A. Puszkarska, J. Tritt-Goc *Electrochim. Acta* 165 (2015) 122
- [2] M. Bielejewski, A. Łapiński, O. Demchuk *J. Coll. Interf. Sci.* 490 (2017) 279
- [3] M. Bielejewski, *Electrochim. Acta* 174 (2015) 1141.