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Authors: Nerea Gil-González, Tugce Akyazi, E. Castaño, F. Benito-Lopez, M.C. Morant-Miñana



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Elucidating the role of the ionic liquids in the actuation behavior of thermo-responsive ionogels

Nerea Gil-González¹, Tugce Akyazi^{2,3}, E. Castaño¹, F. Benito-Lopez³, M.C. Morant-Miñana^{*.4}

1. CEIT and Tecnun (University of Navarra), Donostia-San Sebastián, Spain

2. Tecnun (University of Navarra), Donostia-San Sebastián, Spain

3. Analytical Microsystems & Materials for Lab-on-a-Chip (AMMa-LOAC) Group, Microfluidics Cluster UPV/EHU, Analytical Chemistry Department, University of the Basque Country UPV/EHU, Vitoria-Gasteiz, Spain

4. CIC nanoGUNE Consolider, Donostia-San Sebastián, Spain

e-mail corresponding: mc.morant@nanogune.eu

Research highlights:

- Charge transfer resistance depends on the porosity and chemical structure of the ionogel
- Ionogels with polar ionic liquids are excellent for fast response applications
- Nonpolar ionic liquids result in ionogels with more robust actuator behavior

Graphical abstract



Abstract

The characterization of a thermo-responsive ionogels with electrochemical impedance spectroscopy using gold interdigitated electrodes is described. The ionogel is synthesized using poly(*N*-isopropylacrylamide) as thermo-responsive gel and polymerized in the presence of two ionic liquids: ethyl-3-methylimidazolium ethyl sulfate or trihexyltetradecyl-phosphonium dicyanamide. The changes on the charge-transfer resistance show a clear dependence on the porosity and on the chemical structure of the ionogel. Moreover, the charge-transfer resistance parameter can be used to track in real time the photopolymerization and the hydration process of the ionogels. After exposing them to several drying/rehydration cycles the switching performance is fully understood. The results show that the ionogel with 1-ethyl-3-methylimidazolium ethyl sulfate requires less time to absorb and release water and

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