



Ionogels Containing EMImFSI Obtained via Photopolymerization: Tailoring Mechanical and Electrochemical Properties for Flexible Energy Storage Devices

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Conference

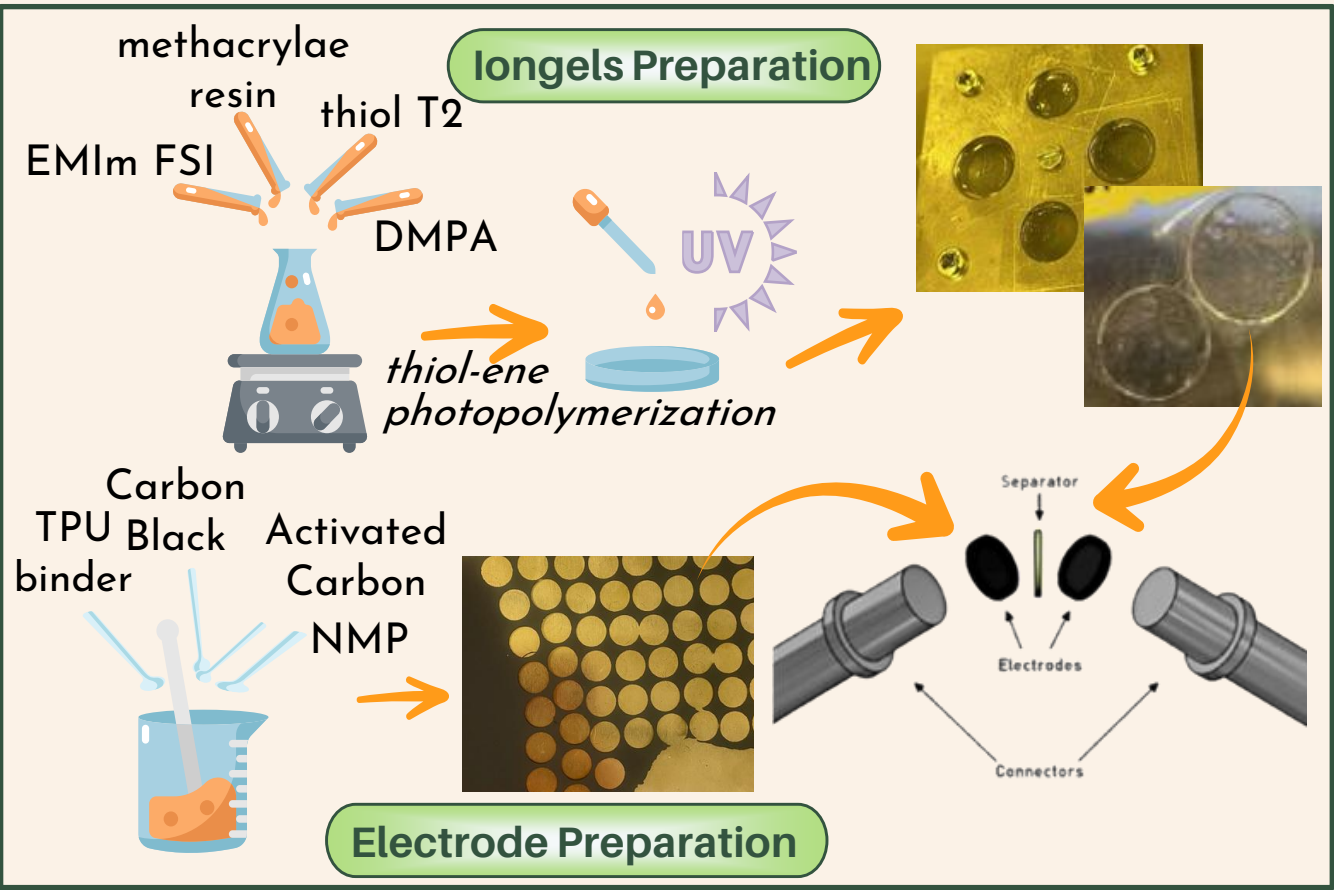
Authors: Wiktoria Patz, Adrianna Gołuchowska, Piotr Gajewski, Agnieszka Marcinkowska

Department of Polymeric Materials, Poznan University of Technology

Introduction

- Rapid growth of supercapacitors, fuel cells, and flexible power sources
- Need for new, efficient, and stable materials
- Ionogels = ionic liquid + polymer matrix
→ high ionic conductivity, flexibility, and chemical stability

This study presents the synthesis and comprehensive characterization of ionogels containing 1-ethyl-3-methylimidazolium bis(fluorosulfonyl)imide (EMIm FSI), aimed at evaluating their potential use as gel polymer electrolytes in electrochemical capacitors.

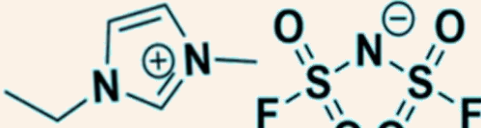


Capacitor systems:

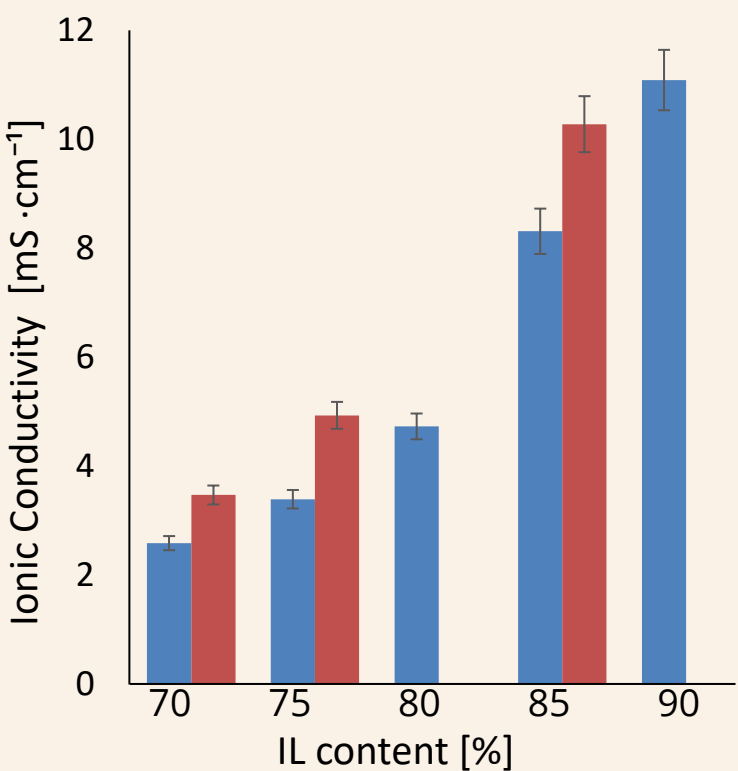
- electrode with an EMImFSI and a GF separator (**IL+GF**)
- electrode with an ionogel containing 90 wt.% of EMImFSI and a GF separator (**GEL+GF**)
- electrode with an ionogel containing 90 wt.% of EMImFSI and an ionogel separator containing 70 wt.% of EMImFSI (**GEL+GEL**)
- electrode with an EMImFSI and an ionogel separator containing 70 wt.% of EMImFSI (**IL+GEL**)



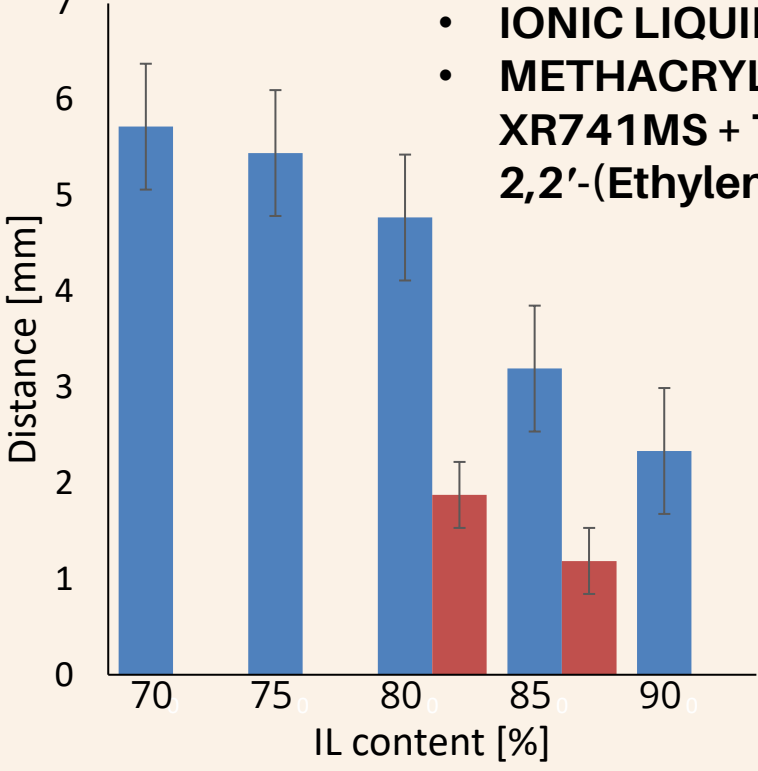
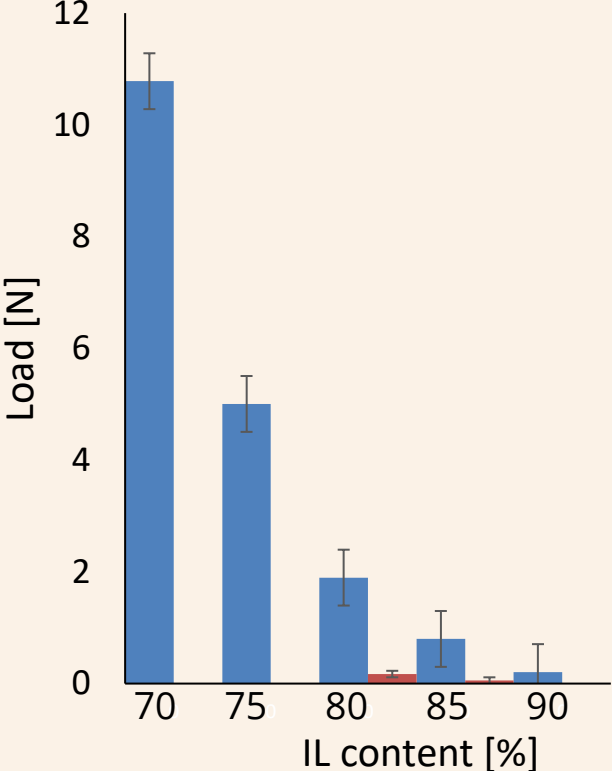
The research focus → evaluation of the influence of ionogel composition on their structural, mechanical, and electrochemical properties.



Results of ionic conductivity



Results of mechanical investigation



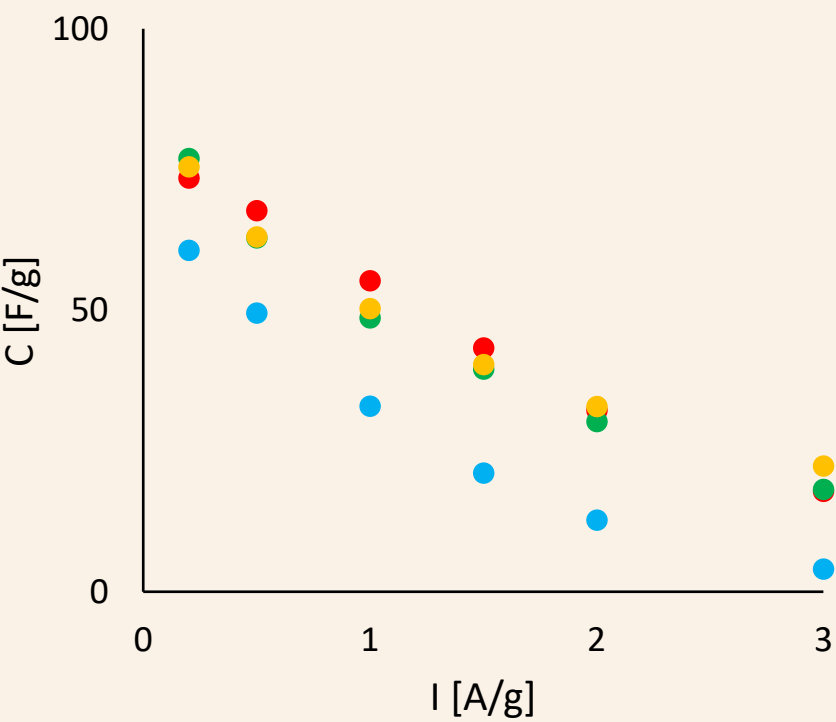
STUDIED COMPOSITION:

- IONIC LIQUID - EMIm FSI
- METHACRYLATE RESIN - Bomar XR741MS + THIOL - T2 2,2'-(Ethylenedioxy)diethanethiol

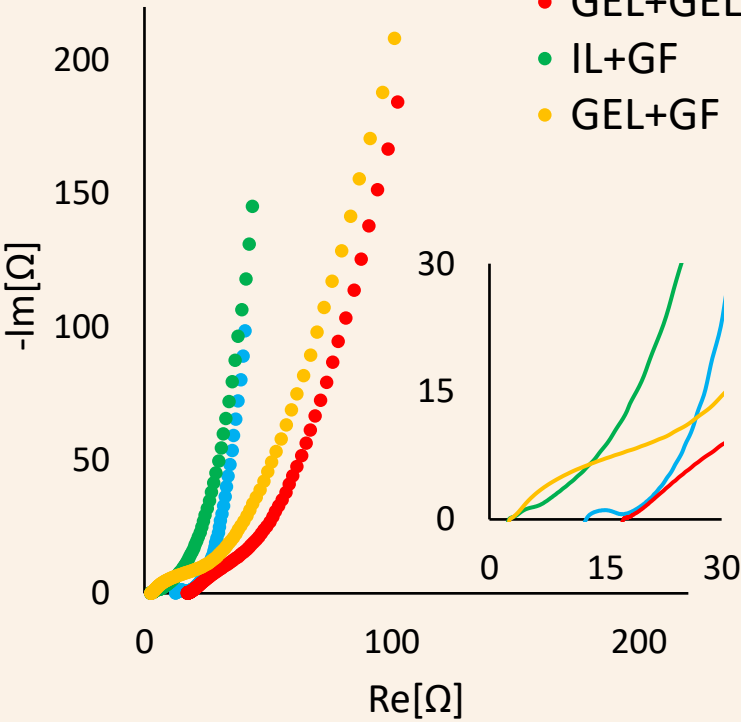


- pure resin
- resin + thiol

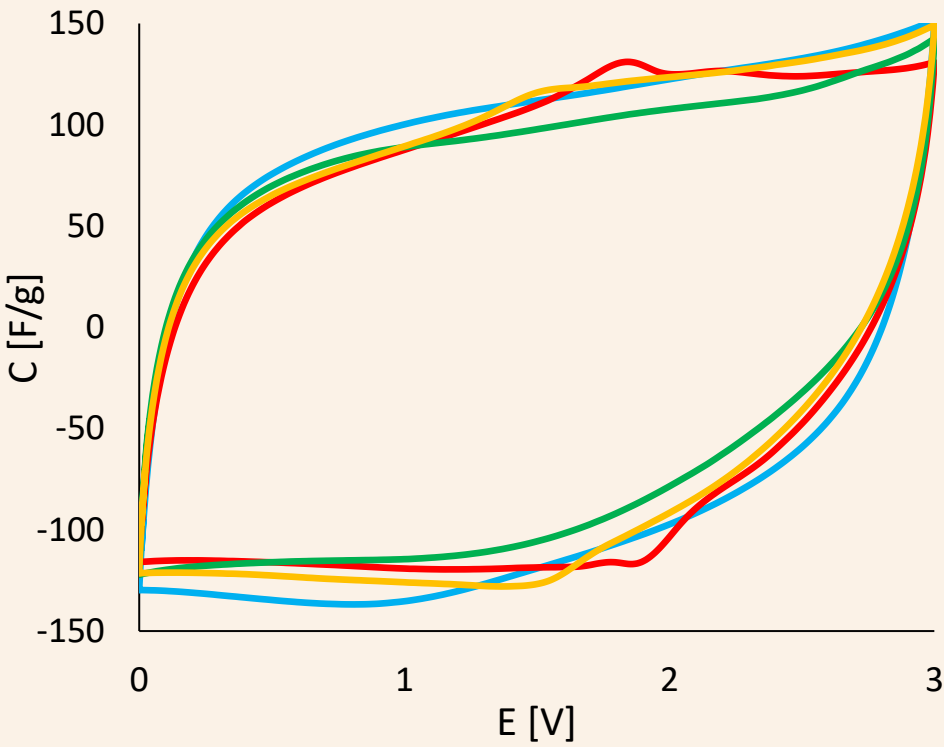
Results of electrochemical investigation



Galvanostatic Charge/Discharge



Impedance Spectroscopy



Cyclic Voltamperometry – 5 mV/s; 3V

Conclusions

1. XR 741 MS-based ionogel was developed, showing high ionic conductivity, good mechanical stability, flexibility, and no solvent leakage.
2. Gels containing 70% IL were mechanically stable, which allowed increasing the IL content to 90% and obtaining mechanically stable gels with significantly higher conductivity.
3. Thiol T2 caused phase separation between GPE components, increasing conductivity but negatively affecting mechanical properties.
4. The GEL+GF system offered the best electrochemical performance of the capacitors - additional redox peaks increase the capacitor capacity.