

# Polymer Ionics Research Group

## Current research works

- Design, synthesis and evaluation of lithium-ion and sodium-ion electrolytes based on our novel anions, as well as optimization of electrolytes composition for maximum performance (conductivity, transference number, melting point).
- Development of polymer electrolytes with supramolecular, ceramic and boroorganic functional additives.
- Investigation and development of mixed gel (liquid-in-polymer, ionic liquid-in-polymer) and composite (ceramic-in-polymer and polymer-in-ceramic) electrolytes.
- Development of ionic liquids conducting with lithium cations, based on novel anions and cations.
- Synthesis of lithium-ion cell anodes with MPCVD (Microwave Plasma Chemical Vapor Deposition), and development of this method.
- Evaluation and investigation of ultracapacitor electrolytes.

## Selected publications

- L. Niedzicki, S. Grugeon, S. Laruelle, P. Judeinstein, M. Bukowska, J. Prejzner, P. Szczecinski, W. Wieczorek, M. Armand, *New covalent salts of the 4+ V class for Li batteries*, J. Power Sources 196 (2011) 8696-8700.
- J. Syzdek, M. Armand, P. Falkowski, M. Gizowska, M. Karłowicz, L. Lukaszuk, M. Marcinek, A. Zalewska, M. Szafran, C. Masquelier, J.-M. Tarascon, W. Wieczorek, Z.G. Zukowska, *Reversed Phase Composite Polymeric Electrolytes Based on Poly(oxyethylene)*, Chem. Mater. 23 (2011) 1785-1797.
- A. Sarnowska, I. Polska, L. Niedzicki, M. Marcinek, A. Zalewska, *Properties of poly(vinylidene fluoride-hexafluoropropylene) gel electrolytes containing modified inorganic Al<sub>2</sub>O<sub>3</sub> and TiO<sub>2</sub> filler, complexed with different lithium salts*, Electrochim. Acta 57 (2011) 180-186.
- L. Niedzicki, M. Kasprzyk, K. Kuziak, G.Z. Żukowska, M. Marcinek, W. Wieczorek, M. Armand, *Liquid electrolytes based on new lithium conductive imidazole salts*, J. Power Sources 196 (2011) 1386-1391.



## Head:

Władysław Wieczorek

## Staff:

Marek Marcinek  
Regina Borkowska  
Michał Kalita  
Maciej Marczewski  
Leszek Niedzicki  
Anna Plewa-Marczewska  
Maciej Siekierski  
Aldona Zalewska  
Grażyna Zofia Żukowska

## PhD students:

Aneta Bernakiewicz  
Marta Kasprzyk  
Rafał Letmanowski  
Michał Piszcz  
Piotr Ryś  
Piotr Wieczorek  
Dariusz Zabost

## Research profile

### Lithium-ion electrolytes:

New anions synthesis  
Lithium cation conducting ionic liquids  
Ceramic additives  
Supramolecular additives  
Boroorganic additives  
Polymer host matrices  
Gel host matrices  
Solvent mixtures and parameters optimization  
Polymer-in-ceramic reversed phase matrices

Sodium-ion electrolytes - new anions synthesis

Electrodes for Li-ion cells made by MPCVD

Electrolytes for ultracapacitors

Fuel cells