

MODIFICATION OF SOLID POLYMER ELECTROLYTES BY ALUMINUM CARBOXYLATES FOR APPLICATION IN LITHIUM-ION BATTERIES

Ewa Zygadło-Monikowska^a, Zbigniew Florjańczyk, Norbert Langwald,
Joanna Tolak, Dorota Gładka

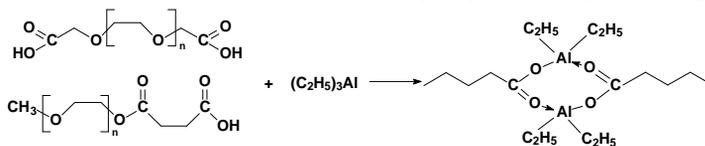
^aWarsaw University of Technology, Faculty of Chemistry, ul. Noakowskiego 3, 00-664 Warsaw, Poland,
ewazyga@ch.pw.edu.pl

ABSTRACT

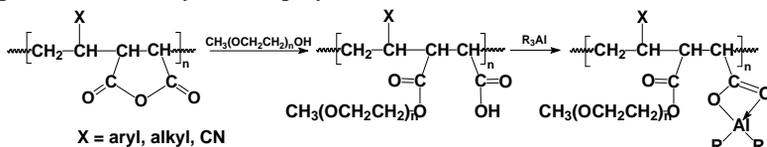
Numerous works on the possibility of utilizing plastic, light solid polymer electrolytes (SPE) as separators in lithium-ion batteries and other electrochemical devices such as sensors and displays were carried out [1]. From the point of view of the operating parameters of a battery, appropriate high ionic conductivity is required, as well as for the electric charge to be transported exclusively or mainly with lithium cations, since only they undergo the reversible electrode reaction. Depending on the measurement method, the lithium transference number values (t_+) of SPE lie in the 0.2–0.4 range [2]. The obtaining of an electrolyte of the lithium cationic transference number equal or close to unity is one of the conditions of technology development involving SPE. One of the methods increasing the t_+ values is the application of additives of Lewis acid properties.

From our studies carried out earlier it appears that the use of aluminum dialkylcarboxylates as components of composite polymer electrolytes (CPE) based on PEO and lithium salts complexes favorably affects the conductivity and mechanical properties of the membranes obtained [3].

In this communication we report the results of studies on the synthesis of new modifiers in the reaction of alkylaluminum with carboxylic acids containing oligomeric oxyethylene groups as:



Another way of obtaining aluminum carboxylates acidic centers in the polymer electrolytes is the reaction of carboxylic acid groups attached to the polymer chain with alkylaluminum, as shown in the example of maleic anhydride copolymers:



In this communication the method of obtaining such modifiers and the results of studies on the effect of these systems on the electrochemical properties of their complexes with lithium salts will be presented.

Acknowledgement: This work was supported by the National Center for Research and Development (Polish-Norwegian Research Programme of Science Pol-Nor/210120/41/2013).

References:

- ¹Quartarone, E.; Mustarelli, P.; *Chem. Soc. Rev.* **2011**, *40*, 2525.
- ²Thomas, K.E.; Sloop, S.E.; Kerr, J.B.; Newman, J. *J. Power Sources* **2000**, *89*, 132.
- ³Zygadło-Monikowska, E.; Florjańczyk, Z.; Rogalska-Jońska, E.; Werbanowska, A.; Tomaszewska, A.; Langwald, N.; Golodnitsky, D.; Peled, E.; Kovarsky, R.; Chung, S.H.; Greenbaum, S.G. *J. Power Sources* **2007**, *173*, 734.