

Increase in the ionic conductivity of LiPON-type thin films electrolyte for lithium microbatteries

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Introduction

With the development of portable electronic devices, thin films microbatteries are becoming an interesting alternative to button cells or supercapacitors [1]. The most useful electrolyte is the LiPON, proposed by Bates et al. [2]. The objective of this study is to increase the ionic conductivity of LiPON to reduce the internal resistance. The increase of the ionic conductivity with the increase of the Li content was studied. Correlation between stoichiometry and performance of the electrolyte were analyzed.

Experimental

The LiPON-type electrolyte films were deposited using radio-frequency magnetron sputtering. Power, pressure and N₂ flow rate were modified to optimized the electrolyte performances. The deposition rate, ionic conductivity, activation energy, electronic conductivity were determined by impedance spectroscopy and I(t) and the chemical composition by Inductive Coupling Plasma – Optical Emission Spectroscopy.

Results and discussion

With the variation of the deposition parameters, the ionic conductivity was almost doubled with an increase from $1,8 \cdot 10^{-6}$ S/cm for standard LiPON films to $3,2 \cdot 10^{-6}$ S/cm for LiPON-type films (Figure 1).

Conclusion

The new LiPON-type films developed in this study are suitable to be used as electrolyte in microbattery with a promising increase (almost doubled) of ionic conductivity and then a decrease of the internal resistance.

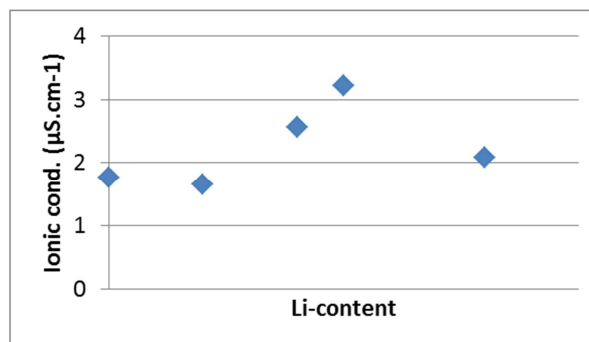


Figure 1 : Evolution of the ionic conductivity versus Li content

[1] B. Pecquenard, F. Le Cras, M. Martin, P. Vinatier, A. Levasseur, R. Salot, Techniques de l'ingénieur, J. Sci. Commun. 163 (2010) 51–59.

[2] J.B. Bates et al J. Power. Sources 43 (44) (1993) 103