새로운 리튬금속고분자2차전지용 고분자 전해질의 전기화학적 특성에 관한 연구

이 영 기 박사

(한국전자통신연구원)

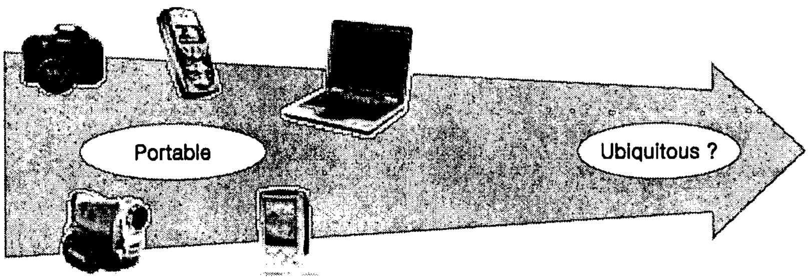
Electrochemical Characteristics of Novel Polymer Electrolytes for Lithium Metal Polymer Batteries(LMPB)

Nov. 21, 2003

Young-Gi Lee, Kwang Man Kim, Yong Joon Park, Young-Sik Hong,
Xianglan Wu, Man Gu Kang, Nam Gyu Park, Kwang Sun Ryu, and Soon Ho Chang

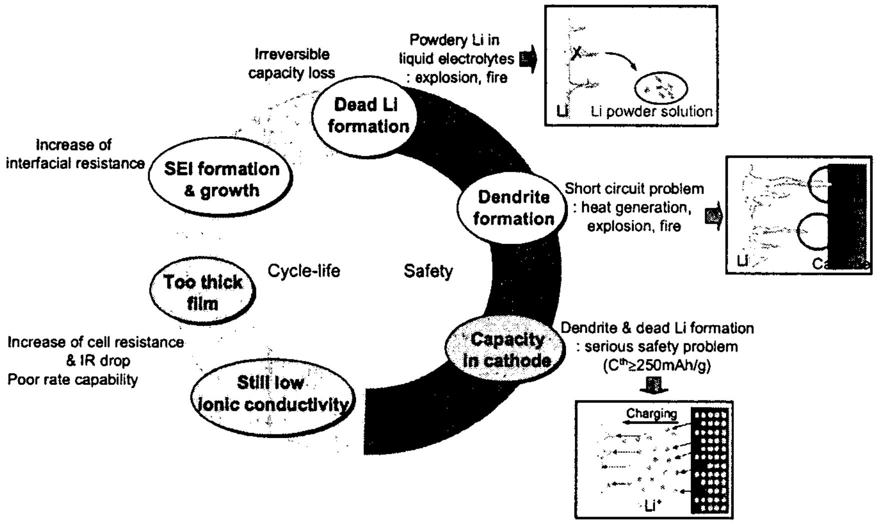
Power Source Device Team,
Electronics and Telecommunications Research Institute (ETRI),
161, Gajeong-dong, Yuseong-gu, Daejon, 305-350, Korea

Development of Small Electronic Devices in Information Technology



Advanced Power Sources of High Energy & Power density

Current Problems in Lithium Metal Polymer Batteries(LMPB)



Research Objective

Design of new electrolyte system: multifunctional polymer electrolytes

- **High ionic conductivity**
- **Strong mechanical property**
- **Plasticized polymer electrolytes**
- **Control of Li anode surface**

Cross-Sectional Structure of Polymer Matrix with Coated Thickness

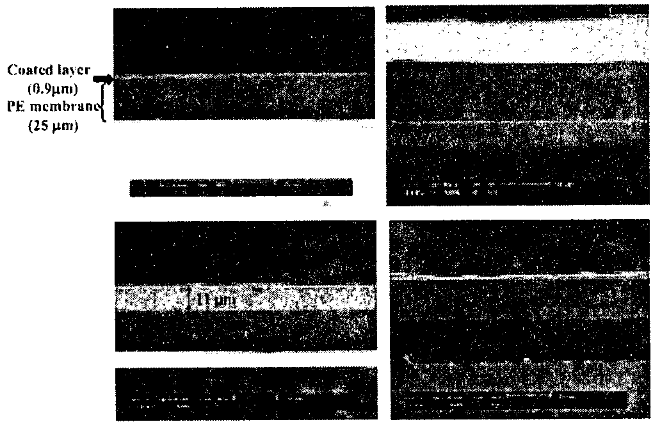


Fig. SEM images(x 1,000) of the cross-section of the matrix polymer as a function of coated thickness.

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Mechanical Property Measurements

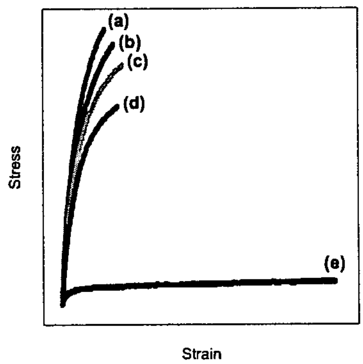

Fig. Typical stress-strain curves for the polymer electrolytes:
(a) PE membrane(–) (b) 0.9μm coated(–) (c) 6μm coated(–) (d) 11μm coated(–)
(e) plasticized polymer electrolytes based on P(VdF-co-HFP) (–)

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Ionic Conductivities of Polymer Electrolytes with Coated Thickness

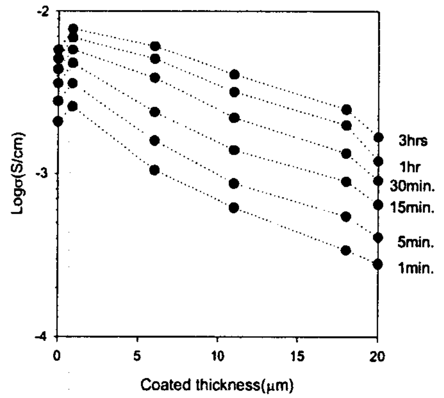

Fig. Ionic conductivities of the polymer electrolytes as a function of coated thickness at different soaking time

Impedance Spectra of Unit Cell with Coated Thickness after 1st Cycle

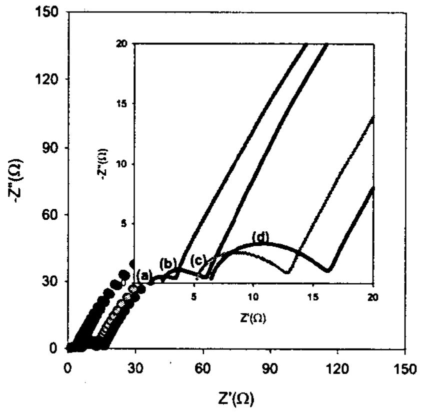

Fig. Typical complex impedance diagram of the unit cell with coated thickness: (a) PE membrane(–) (b) 0.9μm coated(–) (c) 6μm coated(–) (d) 11μm coated(–)

Discharge Capacities of Unit Cell with Cycle Number

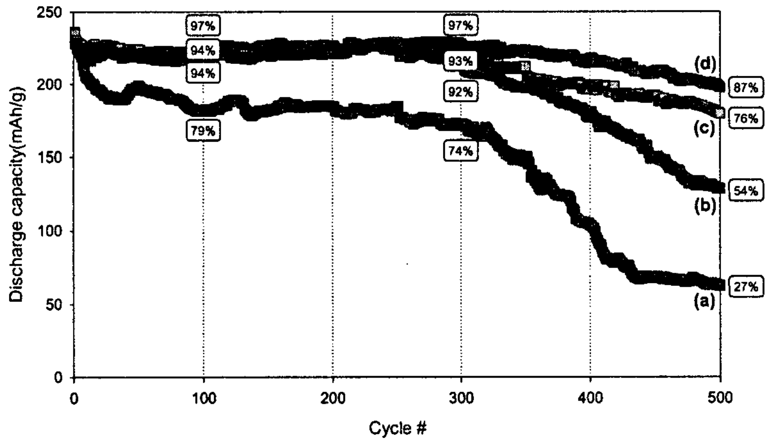

Fig. Discharge capacities of the unit cell with cycle at a constant current density(C/5 rate): (a) PE membrane(■) (b) 0.9μm coated(■) (c) 6μm coated(■) (d) 11μm coated(■)

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Morphology of Li Anode Surfaces in Unit Cell After 500 Cycles

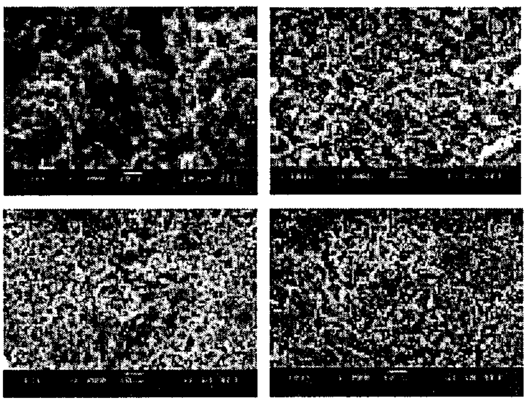

Fig. SEM images(x 1,000) of the Li anode surfaces of the unit cells after 500 cycles of charge/discharge as a function of the polymer electrolytes used: (a) PE membrane (b) 0.9μm coated (C) 6μm coated (d) 11μm coated

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Summary

- **Reaction site control** on the Li anode surface was obtained by introduction of the sub-microporous, compatible layer in the polymer electrolytes
- Enhancement of the **mechanical strength** of the polymer electrolyte film through introduction of microporous, incompatible layer
- Significant improvement in **long-term stability** of the unit cell was obtained by controlling the interface between the Li anode and the polymer electrolytes

Acknowledgement

This work was supported by the Ministry of Information and Communication (MIC) in Korea (2003)