



International Cooperation Education and Career Development(ICECD) Program

Mie University, Japan

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By

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Acknowledgement

I have attend the International Internship program at the Energy Conversion Laboratory ,Graduate School of Engineering, Mie University of Japan together with Suranaree University of Technology. During 9th September until 27th December 2013. The internship program succeeded with the cooperation and help from people and a party from various institutes is following

Professor Nobuyuki Imanishi	Host professor & lab., (Supervisor)
Project Associate Professor Masaki Matsui	Supervisor
Ms.Hiroko Kuwata	1 st -year Master Student, Supervisor
Asst.Prof. Boonchai Wichitsathain	Director, The Center for Cooperative Education and Career Development, Suranaree University of Technology
Ms. Mika Deguchi	Coordinator, International Relations office, Mie University
Ms.Kamonwan Banditsatsisan	Coordinator, The center for cooperative and career development, Suranaree University of Technology

And others, I would like to say thank you for all of people who mentioned above that give me knowledge, coordination, recommendation and help me while I was staying in Japan. I really appreciate that.

Miss Puangpaka Rochanabanthit

International Internship Student

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Personal information

My name is Puangpaka Rochanabanthit. I am 4th year student. I study Chemical Engineering at Suranaree university of Technology, Thailand. Japan was interested in several sides such as technology, language, culture and food. These result of I participated International Cooperation Education and Career Development (ICECD) program. I would like to learn about laboratory techniques and apply my knowledge to works. I would like to apply my knowledge in the tasks and learning for Japanese culture. All of those will be essential for my work in the future.

Introduction Energy Conversion Laboratory

Professor. Nobuyuki Imanishi is the leader of Energy Conversion laboratory.

They are studying development new ceramic materials and its application to energy conversion devices.

Research subjects

1. Lithium-Air batteries
2. Polymer lithium ion batteries
3. Inorganic all solid batteries
4. Batteries using other carriers (Na, Mg, etc)

Laboratory skills

I had been learning and practicing laboratory skills and analytical procedure with Hiriko-san at energy conversion laboratory. I was assigned tasks by Matsui sensei and when the tasks was finished, the result was discussed. At the laboratory have a lot of friends such as Japanese friends, Vietnamese friend and Chinese friends all of them who always take care of me and help me when I got any problems.

Experiment

The electrochemical analyses were carried out using a three-electrode Swagelok cell. Lithium metal was used for all the three electrodes; the working electrode (W.E.), the counter electrode (C.E.) and the reference electrode (R.E.). Ethylene carbonate (EC) and diethyl carbonate (DEC) 1:1 vol% containing $1 \text{ mol dm}^{-3} \text{ LiClO}_4$ was used as base electrolyte. In order to investigate the influence of SEI film by electrolyte additive added to the above electrolyte solution. And using AC impedance analysis.

Electrolytes additive as following.

1. FEC (fluoroethylene carbonate)

2. VC (vinylene carbonate)

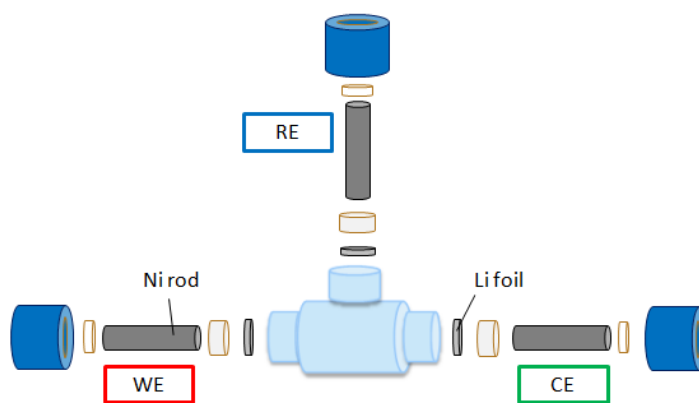


Figure 1 : Swagelok cell

Results

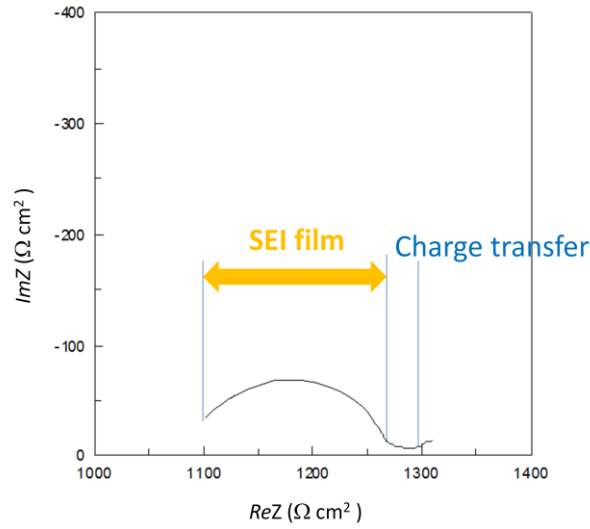


Figure 2 : Nyquist plots for the Li electrode using $1.0 \text{ mol dm}^{-3} \text{ LiClO}_4$ (EC:DEC)

From figure 2 is shown spectra has 2 semicircles the 1st semicircle was assigned to the lithium ion transfer in SEI film and the other semicircle, we suspect it correspond to the charge transfer of lithium ion. In this study we are focusing only the SEI film.

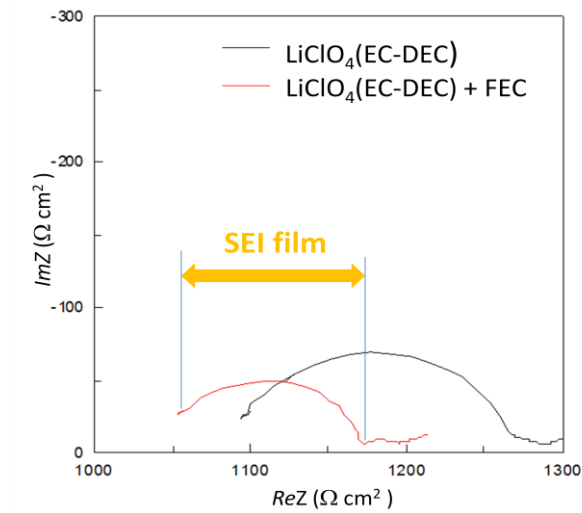


Figure 3 : Nyquist plots for the Li electrode using $1.0 \text{ mol dm}^{-3} \text{ LiClO}_4$ (EC:DEC)with/without FEC

Figure 3 is shown the comparison of SEI resistance between electrolyte without FEC and with FEC. The SEI resistance was decreased after electrolyte containing FEC.

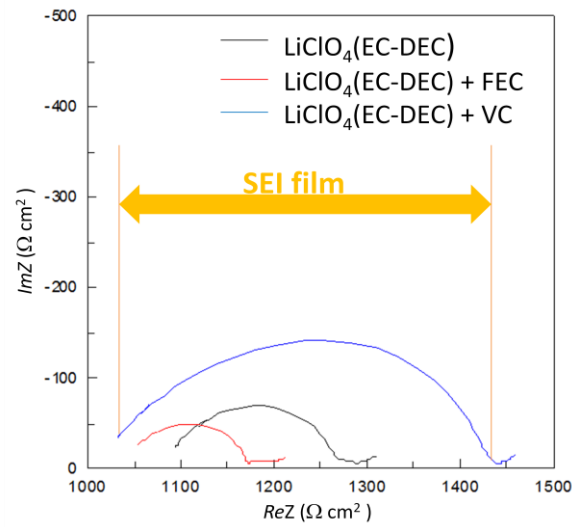


Figure 4 :Nyquist plots for the Li electrode using 1.0 mol dm⁻³ LiClO₄ (EC:DEC)

From figure 4, In the case of electrolyte containing VC got the biggest SEI resistance in another case.

Summary

1. In case of an electrolyte containing FEC, we got a SEI resistance smaller than the additive-free electrolyte.
2. In case of VC we got SEI resistance bigger than additive-free and with FEC.
3. The additive significantly affects to the SEI resistance as we expected.

However, this is primary study which helpful in the future to suppress dendritic.

Living in Japan

First day, after arriving Japan . A Thai student who studying in Mie university picked me at the airport and we had been going to the international student house, my accommodation was facilitated. Second day in Japan, I met Professor Nobuyuki Imanishi , he was introducing me to members at Energy Conversion Laboratory . Everyday life, I commuted from the dormitory to the laboratory by bicycle which borrowed from CIER. Bicycle is very important for me. If I don't have bicycle, It will be difficult to go to everywhere that I want to go . EAON and Cosmos, I always went to both places to bought materials and ingredients for cooking. Sometimes I went to had a dinner at restaurant such as Sushi-roll ,YOSHINOYA etc. There had many kind of food which good tasted.

At the energy conversion laboratory has a lot of members . We always had activitied at laboratory such as soccer match with another laboratory. Every Thursday we were cleaning the laboratory , everyone willing to did it. Sometimes I got any problems they were willing to help me . I can speak only English when I stayed in Japan but that didn't problem to said with them because they tried to speak English with me .

I really had good times when I stayed in Mie university, Japan. I got many experiences, it will be essential for my work in the future. My English was improved and I know some Japanese language.



Traveling



Ise-Jingu Shrine is at the core of sightseeing in Ise, Mie Prefecture. It is simply referred to as Jingu (the Shrine) as an official name, and the Sun Goddess Amaterasu O-mikami is enshrined there.



Osu Kannon is a Buddhist temple of the Shingon sect located in Osu, in central Nagoya, Japan. It belongs to the Owari Thirty-three Kannon.



Tsu festival (Tsu Mutsuri)

I saw the several show from many prefecture.



Kinkakuji (Golden Pavilion) is a Zen temple in northern Kyoto whose top two floors are completely covered in gold leaf.

There is beautiful place with red color of maple leaves.



Kiyomizudera ("Pure Water Temple")

is one of the most celebrated temples of Japan.

Reference

Ryo Mogi, Minoru Inaba, Soon-Ki Jeong, Yasutoshi Iriyama, Takeshi Abe, & Zempachi Ogumi, Effects of Some Organic Additives on Lithium Deposition in Propylene Carbonate .

J.-M. Tarascon¹ & M. Armand², Issues and challenges facing rechargeable lithium batteries .

Hiroko Kuwata, Masaki Matsui & Nobuyuki Imanishi , AC Impedance Spectroscopic Study of Electrodeposition Process of Lithium Metal.

Kang Xu , Nonaqueous Liquid Electrolytes for Lithium-Based Rechargeable Batteries.

Allen J. Bard & Larry R. Faulkner, Department of Chemistry and Biochemistry University of Texas at Austin ; ELECTROCHEMICAL METHODS Fundamentals and Applications (SECOND EDITION).

Andrzej Lasia, Electrochemical Impedance Spectroscopy and its Applications.

Chung Kwang-il, Kim Woo-Seong*, and Choi Yong-Kook ,
Studies on Lithium Electrode Coated with Li_2CO_3 in Lithium Rechargeable Batteries.