

Development of new electrolytes for rechargeable lithium-ion batteries

Background

Smartphones and other portable electronics use rechargeable lithium-ion batteries, which include, among other components, positive and negative electrode materials, and an electrolyte. The electrolyte contains lithium salts, solvents, and additives. While there has been tremendous progress in Li-ion technology development, further improvements with respect to safety, charge density, and lifetime, is desirable. A fundamental major issue is the decomposition of the electrolyte due to the potential difference between electrodes. This issue can be addressed by forming a stabilizing thin film on the electrode surface through various electrolytes. However, the chemical reactions and effects of these electrolytes have not yet been clarified, so it is necessary to conduct experiments by making batteries with various electrolytes and measuring the material properties and battery performance to find optimal solutions.

Goal

The overall goal is to find an electrolyte that gives a battery with fire protection, higher charge density, and longer lifetime. You will gain detail understanding of the manufacturing processes in rechargeable lithium-ion batteries, and the electrolyte you develop may lead to patent applications and scientific publications.

Tasks

1. Discuss, plan, and decide the experimental conditions (with SEL staff).
2. Make batteries with various electrolytes and solution concentrations.
3. Measure and evaluate the battery properties.
4. Create a data base of results.
5. Consider the chemical reactions and effects of each material.
6. Repeat from 2.

Qualifications

- Experience from working with glove boxes and battery charge/discharge testing equipment.
- Adequate attention to laboratory safety; You will handle atmospherically unstable, flammable, and hazardous materials. You need to be very careful about safety.
- Bachelor's degree in chemical engineering, knowledge of electrochemistry, organic chemistry, or equivalent.
- Programming skills such as Python or Excel macros for compiling data.
- Accuracy to input data into a defined format; you need it to determine experimental condition and to use the condition data.
- Good communication skills in English and, preferably, also basic Japanese language skills.

Contact information

This project is hosted by SEL. Students are invited to apply for a scholarship from SEL through the [Sweden-Japan Foundation](#) from 2024-03-15. For more information, please visit the SEL [web site](#) or contact the SEL public relations team at info@sel.co.jp.