

Symposium 16: Single Crystals, Thin Films and Microstructures in Rechargeable Battery Systems

Over the past decade, substantial advances have been achieved for the developments of anode, cathode and electrolyte materials for lithium ion batteries such as optimizing materials composition, exploring functional dopants and controlling microstructures. These significant improvements allow us to store higher capacity of electrochemical energy in a smaller volume and furthermore the lifetime or charge-discharge-cycles of the battery system becomes much longer than ever before. However, battery cell failures –capacity loss, slower charge rate, or short circuit– inevitably occur and it is therefore necessarily to understand the above failure mechanisms. The materials currently used in real battery cells involve multiple structural, chemical and electrochemical complexations. In order to develop a mechanistic understanding of each failure processes, it is a prerequisite to simplify related materials' structures and their interfaces, e.g. by using the forms of single crystals or thin films. These failure issues are essentially related to the pre-existence and/or the developments of atomistic defects during electrochemical cycling, such as transition metal antisite defects, oxygen vacancies, reconstruction of the surface structures. Atomic-resolution electron microscopy, scanning tunneling microscopy and atomic force microscopy should be versatile tools for defective structural analysis.

This symposium will focus on the growth methodology of high purity single crystals and thin films and their atomic and electronic structure analysis based on microscopy for the understanding of hindered lithium ion battery materials problems. We will also provide the discussion among the group of people in this field, leading to the further synergetic collaborations.

<PROPOSED SESSION TOPICS>

- Synthesis of single crystals and thin films
- Atomic and electronic structure analysis of defects, surface and interfaces
- Atomic-resolution STEM, STM, AFM

<ORGANIZERS>

Ryo Ishikawa, University of Tokyo, Japan, email: ishikawa@sigma.t.u-tokyo.ac.jp

Nobuyuki Zettsu, Shinshu University, Japan

Yumi H. Ikuhara, Japan Fine Ceramics Center, Japan

Taro Hitosugi, Tokyo Institute of Technology, Japan

Miaofang Chi, Oak Ridge National Laboratory, USA

Sung-Yoon Chung, Korea Advanced Inst. Sci. and Tech., Korea

Lin Gu, Chinese Academy of Science, China

Rong Huang, East China Normal University, China

<INVITED LECTURES>

Tentative invited lecture information is posted in the following URL;

http://www.ceramic.or.jp/pacrim13/list_of_invited_speakers.html#16