Development of *in situ* Technique for Battery Study using Special Environment Neutron Powder Diffractometer, SPICA

M. Yonemura[1,2], K. Mori[3], T. Kamiyama[1,2], T. Fukunaga[3], Y.Ishikawa[1], S. Torii[1,2], R. Tomiyasu[1], D. Sulistyanintyas[4], Y. Onodera[3], A. Mitsui[4], T. Naka[4], M. Morishima[4], H. Sugaya[4], H. Komatsu[4], M. Hirayama[5], R. Kanno[5], N. Kitamura[6], Y. Idemoto[6], K. Shimoda[4], Y. Ukyo[4], H. Arai[4], Y. Uchitmoto[7], and Z. Ogumi[4]

[1]*Institute of Materials Structure Science, KEK, Tokai, Ibaraki 319-1106, Japan*
[2]*J-PARC Center, Tokai, Ibaraki 319-1195, Japan*
[3]*Research Reactor Institute, Kyoto University, Kumatori, Osaka 590-0494, Japan*
[4]*Office of Society-Academia Collaboration for Innovation, Kyoto University, Uji, Kyoto, 611-0011, Japan*
[5]*Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology, Yokohama, Kanagawa 226-8502, Japan*
[6]*Faculty of Science & Technology, Tokyo University of Science, Noda, Chiba, 278-8510, Japan*
[7] *Graduate School of Human and Environmental Studies, Kyoto University, Kyoto, 606-8501, Japan*

 # a corresponding author: E-mail yone@post.kek.jp

SPICA, a new special environment powder neutron diffractometer was built at BL09 in the Material and Life science Facility (MLF) of the Japan Proton Accelerator Research Complex (J-PARC). This is the first instrument dedicated to the study of next-generation batteries in J-PARC and is optimized for *in situ* measurements to clarify the structural changes of battery materials at the atomic level. To make *in situ* measurements of real batteries more fruitful, we need high $\Delta d/d$ resolution with wider d ranges to detect many phases during chemical reaction, high neutron intensity to know the specific reaction process in high speed charge/discharge, low background and a dedicated chemistry area to carry out long-term scheduled experiments with many sets of *on-beam* measurements and off-beam charge-discharge measurements. In the beginning stage of the commissioning, the structural changes of the electrode materials, which are dependent on the lithium content in a commercialized Li-ion battery, were clearly observed. The current status of SPICA will be reported.

Acknowledgement: This study was supported by the RISING project of NEDO. This work was carried out as the S-type project of KEK (Proposal No. 2009S10).