Detailed analysis of crystallite size of graphitic carbon and its influences on performances of LIB at low temperature

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This work focuses on the effects of crystallite size and its distribution of graphitic carbon influencing on performance of LIB especially at low temperature. Firstly, the X-ray diffraction profiles of several graphitic carbons were analyzed by the fundamental parameter (FP) method. Secondly, the structure changes of graphite during the charge and discharge processes were investigated by *operando* measurement using synchrotron radiation at SPring-8.

The analysis of FP method revealed that crystallite sizes and their distributions of graphitic carbons influences on LIB performance especially at low temperature. Coin cells composed of carbon and NMC electrodes were prepared and subjected to the evaluation of battery performances. The result showed that crystallite sizes and their distributions influence on the phase structure changes and give major effect on charge and discharge performances of graphite negative electrode at low temperature.

Further, crystal structures of lithium-intercalated graphite during charge and discharge processes were investigated by *operando* analysis using synchrotron radiation diffraction. The diffraction patterns were obtained by two-dimensional detector (Pilatus100k). The time resolution of the apparatus is the order of milliseconds for analysing one diffraction pattern. Half cells using lithium foil as a counter electrode were prepared and examined by *operando* analysis. The detail results will be shown in the conference.

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