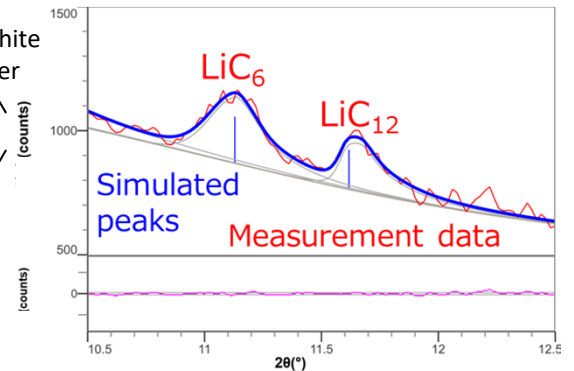
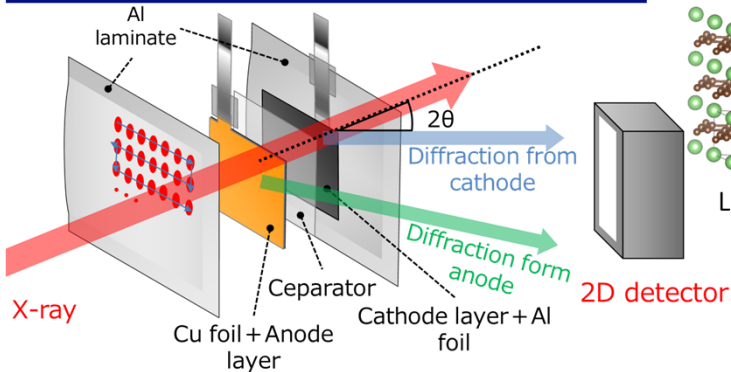


Mapping of charge state of graphite anode and identification of metallic Li deposition area

The structure change during charge / discharge cycle can be visualized nondestructively by XRD measurement with high energy X-ray. Here, we will introduce the results of mapping the charge state of the graphite anode in laminated cell and evaluate the chemical state of Li inside the laminated cell.

Mapping measurement of laminated cell



The amount of Li insertion can be estimated from the intensity ratio of LiC_6 and LiC_{12}

Distribution of charged state of graphite anode

<Laminated cell configuration> Cathode: NCM523 Anode: Graphite Electrolyte: 1M LiPF_6 EC:DEC=3:7(vol%)
 <Cycle condition> 1C rate, 300cycle, 0.1C rate every 100 cycles

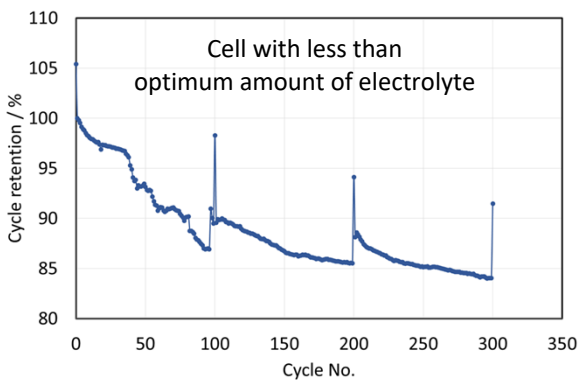
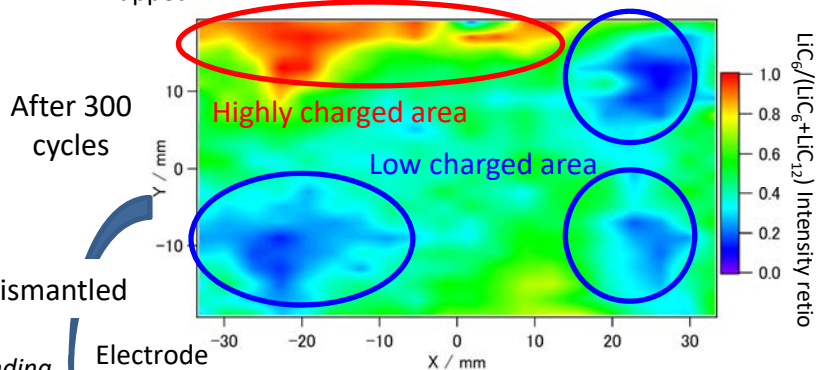


Fig1. Cycle characteristics of laminated cell

mapping measurement of graphite anode

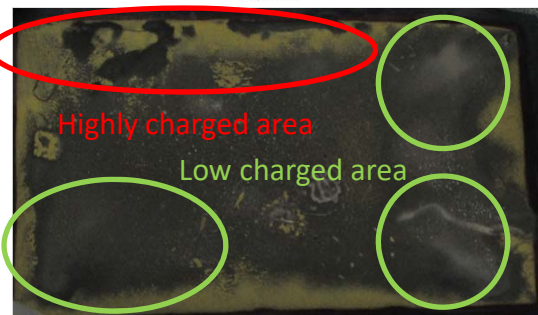
<measurement condition>

charged to 4.2V at 1C, measurement area 40 x 70 mm with 20 vertical x 20 horizontal points, and $\text{LiC}_6 / (\text{LiC}_6 + \text{LiC}_{12})$ ratio was mapped.



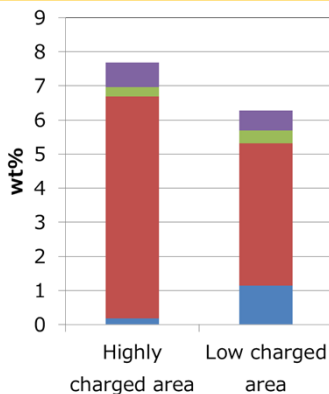
Dismantled

Electrode picture



Corresponding appearance of anode electrode

Amount of Lithium and its chemical state



Li metal preferentially deposits on the low charged area of graphite anode. This suggests that the resistance in the anode electrode is non-uniform.