

In-depth Analysis of Binder Distribution within Lithium-ion Battery Electrode by Using SAICAS

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Binder distribution of lithium ion battery (LIB) electrodes is as important as the use of high capacity active materials in high load electrodes. The reason is because if the distribution of the binder by the depth is not uniform, the electrode coating layer can be peeled from the current collector within the use time. However, due to the limitations of analytical tools, it is difficult to obtain information on binder distribution within electrode. Fortunately, however, we began to analyze these problems using a new tool, surface and interface cut analysis system (SAICAS, Daipia Witnes, Japan) to measure the adhesion properties of LIB composite electrodes as a function of depth. Since the adhesion strength measured by SAICAS is approximately proportional to the binder content, SAICAS can be used to indicate the binder distribution within the electrode.

In this study, two LiCoO₂ electrodes were prepared at different drying temperatures, 130°C and 230°C to determine the relation between binder distribution and adhesion strength. First, the adhesion of the electrode was measured at every 10 μm from the electrode surface as shown in the figure. At the same time, surface and cross-sectional SEM images as well as the corresponding EDS atomic mapping were matched in correlation with the adhesion strength. Electrochemical properties such as DC-IR, speed performance and cycle life at room and high temperatures were also investigated.

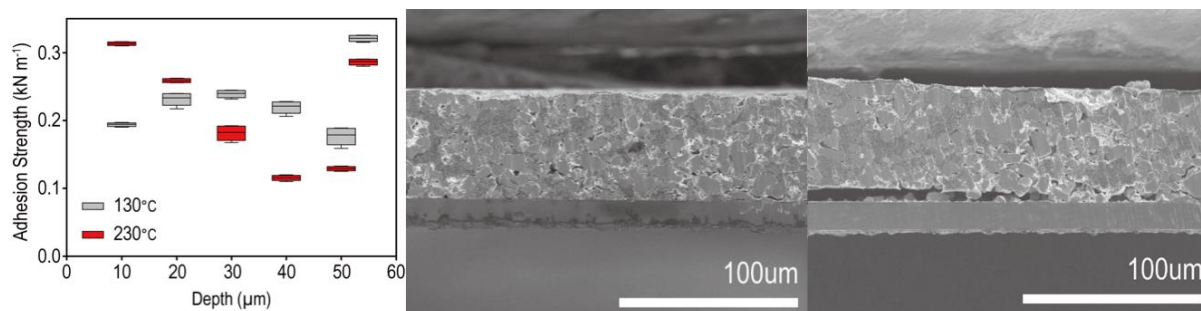


Figure. Adhesion strength of tow electrodes dried at 130 and 230oC as a function of depth (left) and their cross-sectional SEM images after high-temperature cycling (right)

References:

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