Evaluation of the adhesive strength between the electrode slurry coating and the metal foil used for electrode materials (2)

Point: Measurement of weak adhesive bond substrates not affected by the backing's stiffness of the adhesive tape used to peel off the thin film.

Keywords: Peel angle dependency

Versatile Peel Analyzer - VPA-3

Background

The existing oxide film on the aluminum foils used as electrode material increases the electrical resistance, negatively affecting the electron transfer.

A conductive carbon slurry coating on the aluminum foil's surface helps to reduce this resistance.

Finding formulations to overcome the challenging adhesion conditions at the aluminum-slurry interface is critical to avoid unwanted separations of the coating from aluminum foil, the main reason for short-circuits and battery damage.

Problems to be solved

Although improving the adhesion is an issue, the bonding strength between the aluminum foil and the conductive carbon coating film is still meager. Therefore, using a conventional tensile tester with the 180° peel test may be challenging or impossible.

In addition, the coating film may separate from the aluminum foil immediately when bent to 180° due to the backing's stiffness of the adhesive tape used to peel off the thin film.

Measurements and results

The Kyowa Versatile Peel Analyzer model VPA-3 performed the measurements using a standard full-scale 5N load cell. The peel angles for samples A and B were 180°, 90°, and 45°, respectively.

As a result, the smaller the peeling angle, the more significant the difference between samples A and B.

In particular, the 45° peel angle shows a remarkable difference in the peel force between both samples.

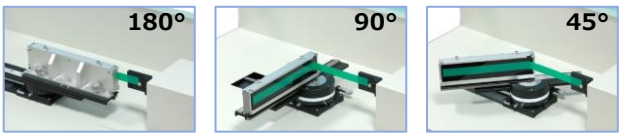

Figure 1 – Sample stage in different positions

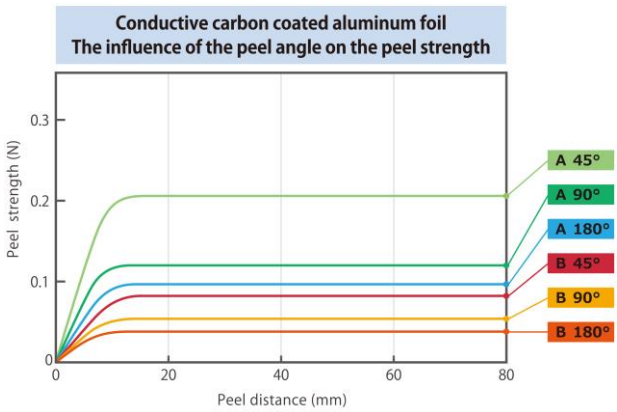

Figure 2 – Comparison chart of the test results

Conclusion

Lower peel angles reduce the influence of the rigidity of the adhesive tape's backing on the peel force. The difference between the samples comes more apparently by detecting the forces further toward the shearing direction of the coating film.

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