

Moisture Management and Interfacial Adhesion in Layered Artificial Graphite Anodes

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The drying process of electrodes is a critical determinant of battery performance. For layered artificial graphite, moisture trapped within 2D interlayer edges triggers side reactions with the electrolyte, leading to capacity fade. Furthermore, aggressive drying conditions often compromise the structural uniformity of the layered electrode, deteriorating its electrochemical properties. In this study, we investigate the correlation between drying parameters and the physical/chemical integrity of graphite-based anodes to enhance reliability.

Quantitative analysis using Karl Fischer titration revealed that while moisture content drops significantly immediately after drying, rapid re-adsorption occurs over time due to the high surface energy of the 2D carbon architecture, highlighting the necessity of optimized temperature-time profiles. Additionally, peel strength tests were conducted to evaluate the mechanical adhesion between the active material layer and the current collector. Our results demonstrate that precise moisture management and high adhesion stability are critical to optimizing the initial efficiency and long-term stability of 2D-structured carbon electrodes. This study provides a fundamental processing framework for optimizing electrode fabrication processes for secondary batteries. This work was supported by the Technological Innovation Development Program funded by the Ministry of SMEs and Startups (MSS), Republic of Korea (Project No. RS-2024-00416095).

References

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Figures

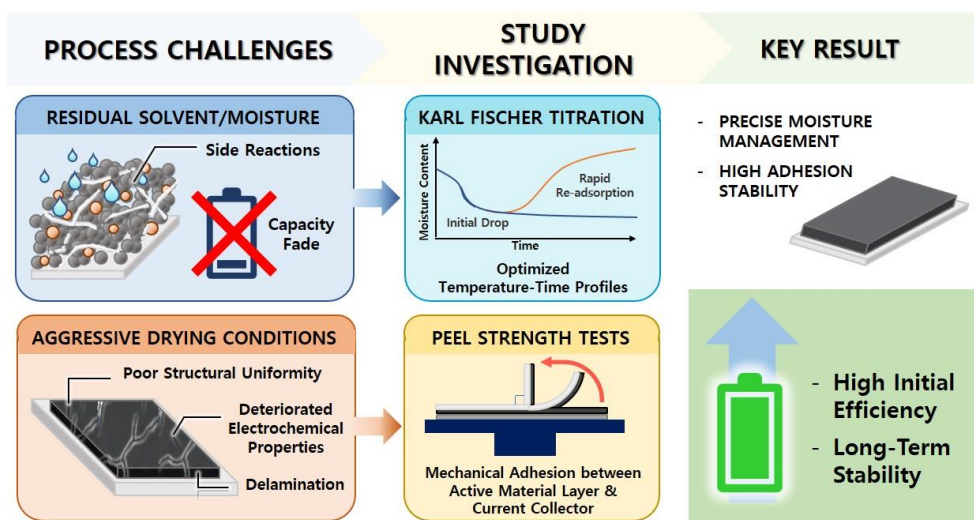


Figure 1: Graphical abstract for optimizing moisture management and adhesion stability in layered artificial graphite anodes.