Application Note BATT1024

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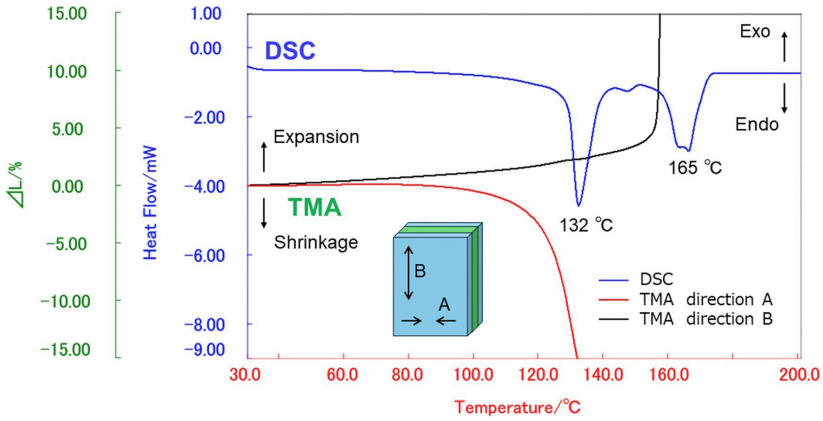
BATT1024 - Thermal Stability Analysis of Separators via DSC and TMA

Introduction

The primary function of separators in Li-ion batteries is to prevent contact between anode and cathode while facilitating Li-ion transport through fine pores. The separators require dimensional stability within the operating temperature range and a shutdown function that collapses the pores to prevent thermal runaway. Thermomechanical Analysis (TMA) and Differential Scanning Calorimetry (DSC) are applied to characterize this performance.

Thermal analysis

- **Analysis:** Separator material
- **Analysis method:** Melting, Expansion/Shrinkage
- **Use:** Evaluation of thermal stability
- **Analyzed materials:** Three-layer separator



DSC revealed endothermic peaks corresponding to the melting of polypropylene and polyethylene at 132°C and 165°C, respectively. The melting of porous polyethylene triggers the shutdown function.

With TMA, we can identify shrinkage around the polyethylene melting temperature in the A direction, while elongation occurs above the polypropylene melting temperature in the B direction.

Conclusion

TMA and DSC allow us to evaluate the thermal shrinkage and shutdown temperature of separators. These analyses are valuable for evaluating separator thermal stability and guiding material selection.

Related products

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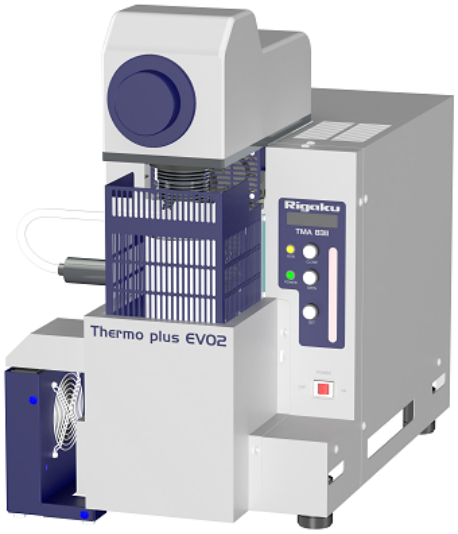

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TMA is the measurement of a change in dimension or mec hanical property of the sample while it is subjected to a con trolled temperature program.