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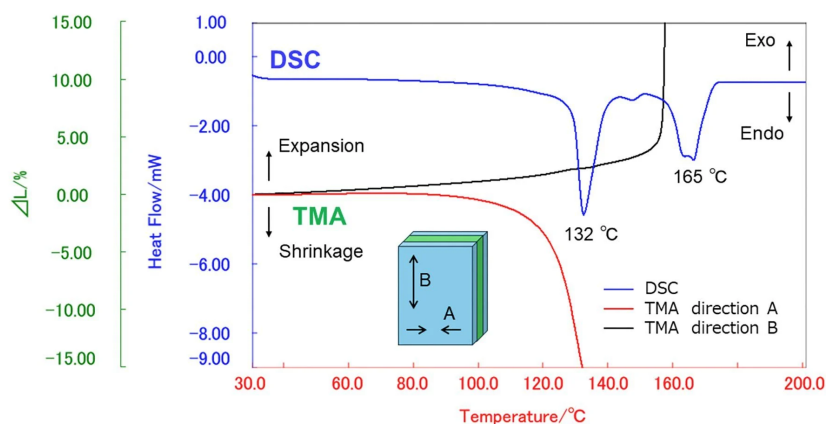
BATT1024 - Thermal Stability Analysis of Separators via DSC and TMA

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

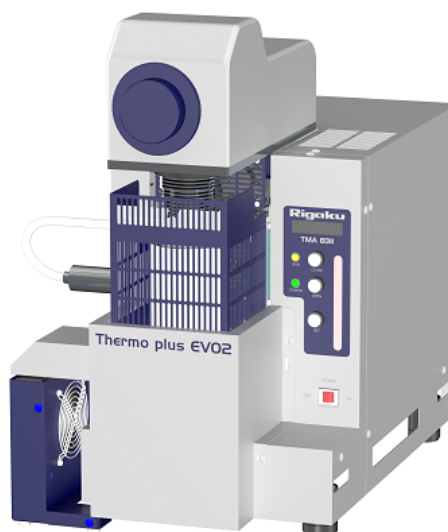
TMA and DSC allow us to evaluate the thermal shrinkage and shutdown temperature of separators. These analyses are valuable for evaluating separator thermal stability and guiding material selection.

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TMA8311

TMA is the measurement of a change in dimension or mechanical property of the sample while it is subjected to a controlled temperature program.