

[View on rigaku.com](https://www.rigaku.com)

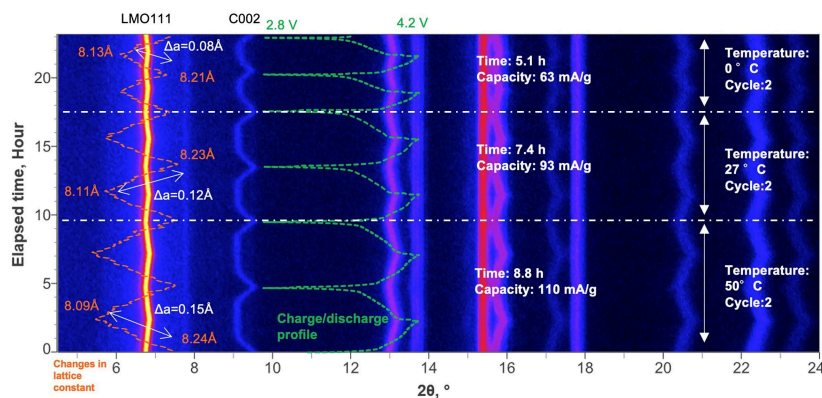
# BATT1018 - XRD Measurement with Temperature Control and Charge/Discharge Using Laminated Cells

## Introduction

With car-mounted batteries, etc. used in an environment with assumed temperature changes, stability in the crystal phases upon charging/discharging is required at each temperature. With an attachment that enables the implementation of XRD while charging/discharging and modifying temperatures while doing so, it became possible to verify crystal phase behavior.

### Phase transition analysis

- **Analysis:** Whole battery
- **Analysis method:** Operando measurement
- **Use:** Improving battery performance
- **Analyzed materials:** Laminated cell (Cathode  $\text{LiMn}_2\text{O}_4$ , LMO, anode C, separator, electrolyte solution)



**Figure 1:** Elapsed time vs  $2\theta$ , charge/discharge profile and changes in lattice constant (inside image)

As the temperature goes from high to low, the battery capacity decreases. Accompanying this, the difference in changes in the lattice constant as indicated by  $\Delta a$  has become smaller. It can therefore be surmised that the Li ions are exhibiting less movement.

---

## Conclusion

It is possible to measure changes in the crystal phase during charging/discharging while modifying temperature. When the temperature was lowered, changes in battery capacity were successfully verified. It could be surmised that changes in battery capacity are related to the amount of change in the lattice constant.

---

## Related products



### SmartLab

Advanced state-of-the-art high-resolution XRD system powered by Guidance expert system software