# InSight Series

Soft-Pack Battery Transmission X-ray Diffractometer

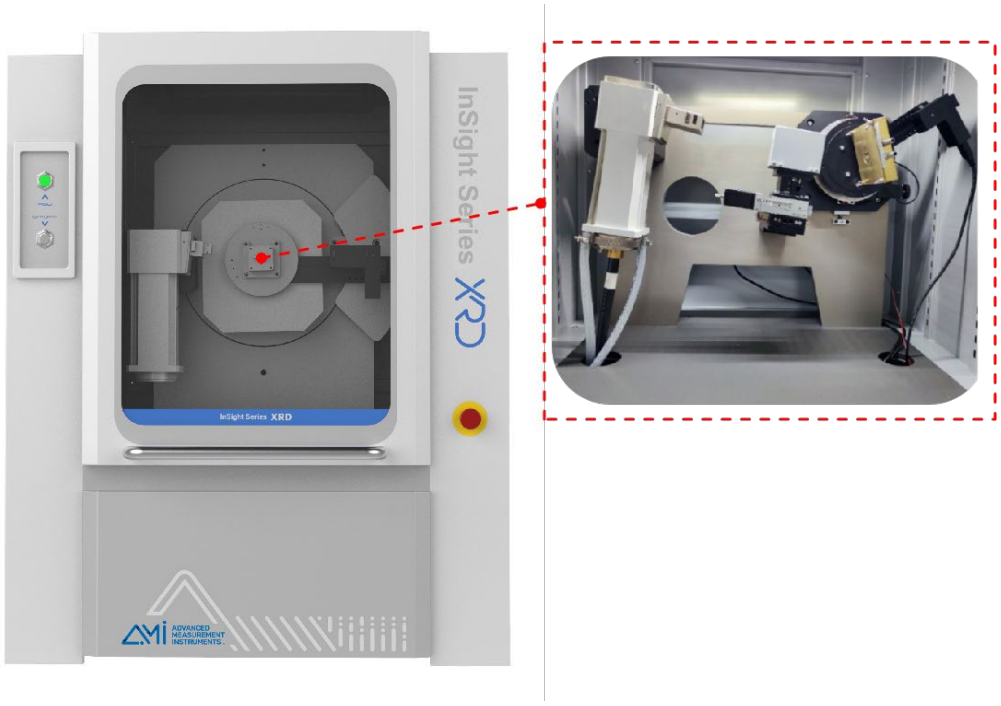
## INTRODUCTION

*"See the change, unlock the InSight "*

Soft-pack (pouch) batteries play a critical role in both cutting-edge research and next-generation commercial energy storage. Yet studying their internal behavior during charge and discharge—especially over long cycles—has been limited by the constraints of traditional in-situ XRD methods. The **InSight Series** changes that.

This dedicated in-situ Transmission X-ray Diffractometer is purpose-built for soft-pack battery analysis. Unlike conventional reflective-style molds, the InSight Series uses a vertical transmission geometry to collect diffraction data from both the anode and cathode simultaneously—across the full cell thickness.

Paired with a high-intensity 1600 W Mo X-ray source, a photon-counting 2D array detector, and precision temperature control from -30°C to 300°C, the InSight Series offers unmatched resolution, speed, and stability for real-time battery material studies.

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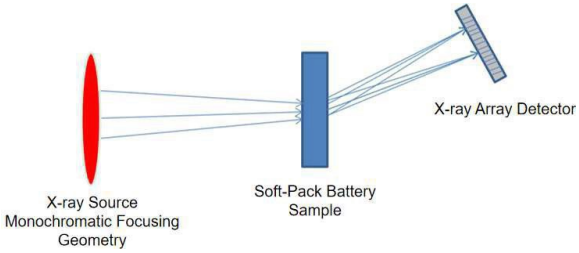
**Why In-situ Transmission XRD for Soft-Pack Batteries?**

- **True Long-Term Cycling:**
  Unlike coin cell molds, soft-pack batteries offer superior sealing and stability for thousands of cycles.
- **Full-Depth Material Insight:**
  Vertical transmission geometry collects diffraction data through the entire pouch—enabling dual-electrode analysis.
- **Superior Resolution at Any Thickness:**
  Focused beam transmission ensures peak clarity, even in thicker pouch cells.
- **Thermal Behavior Included:**
  Variable-temperature stage enables in-situ measurements at both sub-zero and high-temperature conditions.
- **Electrochemistry + Structure, Together:**
  Seamless integration with an electrochemical workstation allows simultaneous control and data acquisition during charging/discharging.




*In-situ Transmission XRD Optical Path Diagram*

## KEY FEATURES

- **1600 W Molybdenum X-ray Tube**
  Delivers strong, high-penetration X-rays optimized for soft-pack battery materials.

- **Photon-Counting 2D Array Detector**
  High-efficiency, low-noise capture of fine diffraction details, with fast scan times.

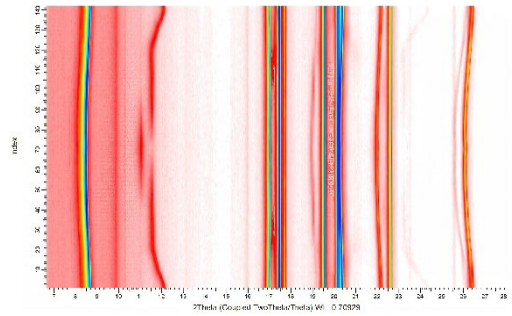
- **Transmission Geometry**
  X-rays enter through one side of the pouch and exit through the opposite—ideal for full-cell analysis.

## KEY FEATURES (cont.)

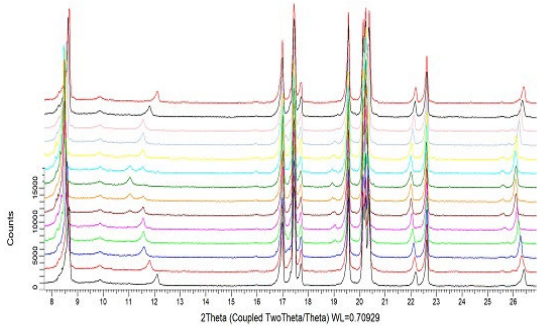
- **Temperature-Controlled Sample Stage**
  Wide range (-30°C to 300°C) supports studies of degradation, performance, and thermal failure.
- **Precision Goniometer**
  Theta–2Theta geometry with a 144 mm radius for stable, accurate angular scanning.
- **Compact Footprint**
  Lab-friendly design with powerful capability: 900 × 680 × 550 mm, 100 kg.

## PERFORMANCE EXAMPLES

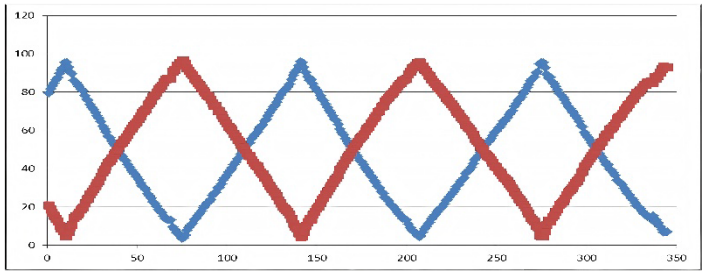
From anode intercalation to cathode degradation and thermal behavior, these performance examples demonstrate the system's ability to deliver high-resolution, high-confidence data—in real time, inside working soft-pack batteries.



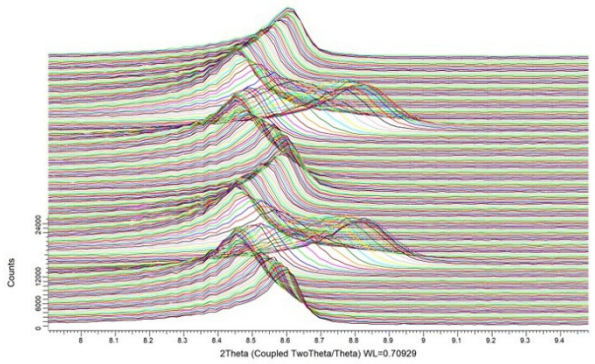
*In-situ Transmission XRD Data Display for Lithium Cobalt Oxide Soft-Pack Battery*



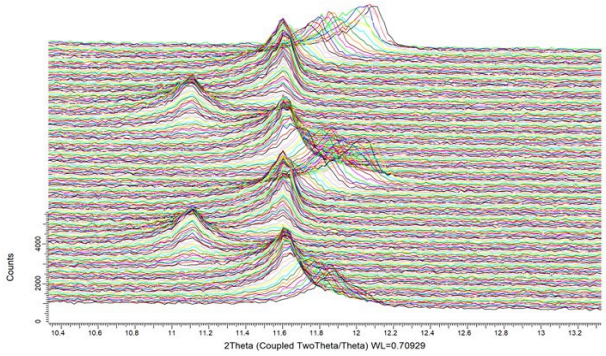

*Single Data Measurement Time: 300 seconds*



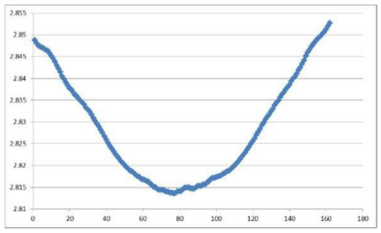

*Variation in $LiFePO_4$ and $FePO_4$ Phase Content*



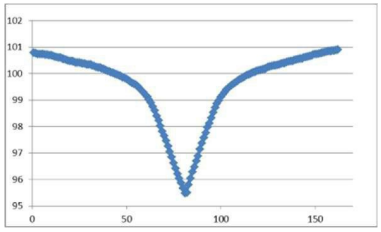

*In-situ Changes of NCM 003 Peak*



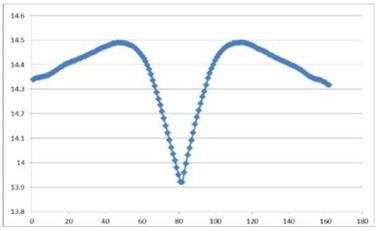

*In-situ Changes of Graphite Negative Electrode in Soft-Pack Battery*



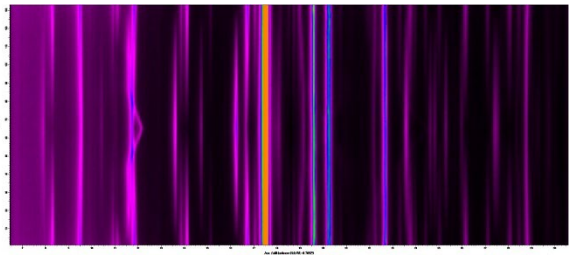
*Variation in NCM Unit*
***Cell Parameter a***



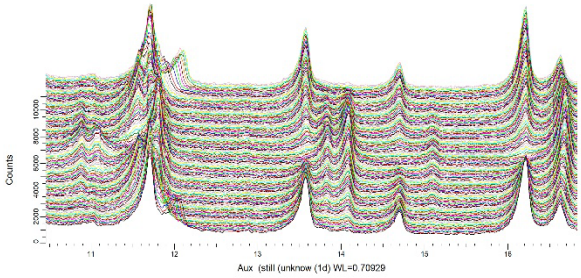
*Variation in NCM Unit*
*Cell Volume*



*Variation in NCM Unit*
*Cell Parameter c*



*In-situ Transmission XRD Data for Lithium Iron Phosphate Soft-Pack Battery*

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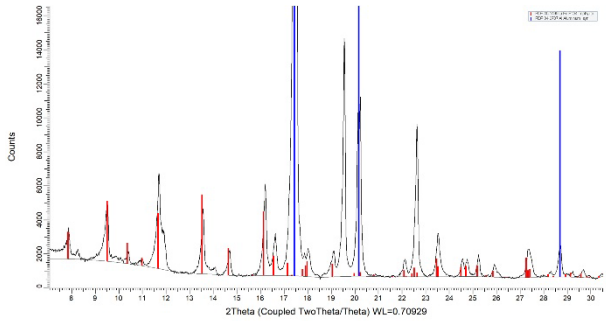
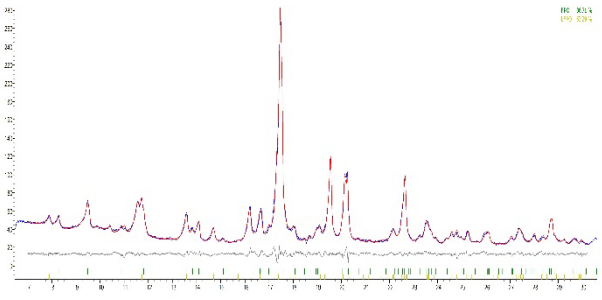



*$LiFePO_4$ Phase Confirmation*



*Phase Content and Structural Information Obtained from XRD Fitting*

## SPECIFICATIONS

| | |
|---|---|
| **X-ray tube** | 1600 W |
| **X-ray tube target material** | Mo |
| **Goniometer** | Theta / 2theta geometry, the radius of the goniometer is 144 mm |
| **Detector** | Photon-Counting two-dimensional array detector |
| **Maximum scanning range** | 0° - 150° |
| **2Theta minimum step size** | ±0.01° |
| **Volume and Weight** | L 35.4 in (900 mm) × W 26.8 in (680 mm) × H 21.7 in (550 mm), 220.5 lbs (100 kg) |
| **Sample stage** | Temperature-controlled sample stage for pouch cells (-30°C - 300°C) |

## ABOUT US

Advanced Measurement Instruments (AMI), consisting of Altamira Instruments, Rubolab, ISI, and JWGB, offers a comprehensive portfolio of solutions for all your material characterization needs. As a global and diversified company, we have many years of professional experience, and our mission is to empower scientists and researchers around the world in the field of materials science by providing cutting-edge analytical instruments. We are committed to providing high-quality, user-friendly, cost-effective products and services to ensure that customers get the best solutions in research and industrial applications.

## MISSION

At AMI, our mission is to advance the world of materials characterization by providing cutting-edge analytical instruments that empower customers in commercial and research fields.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