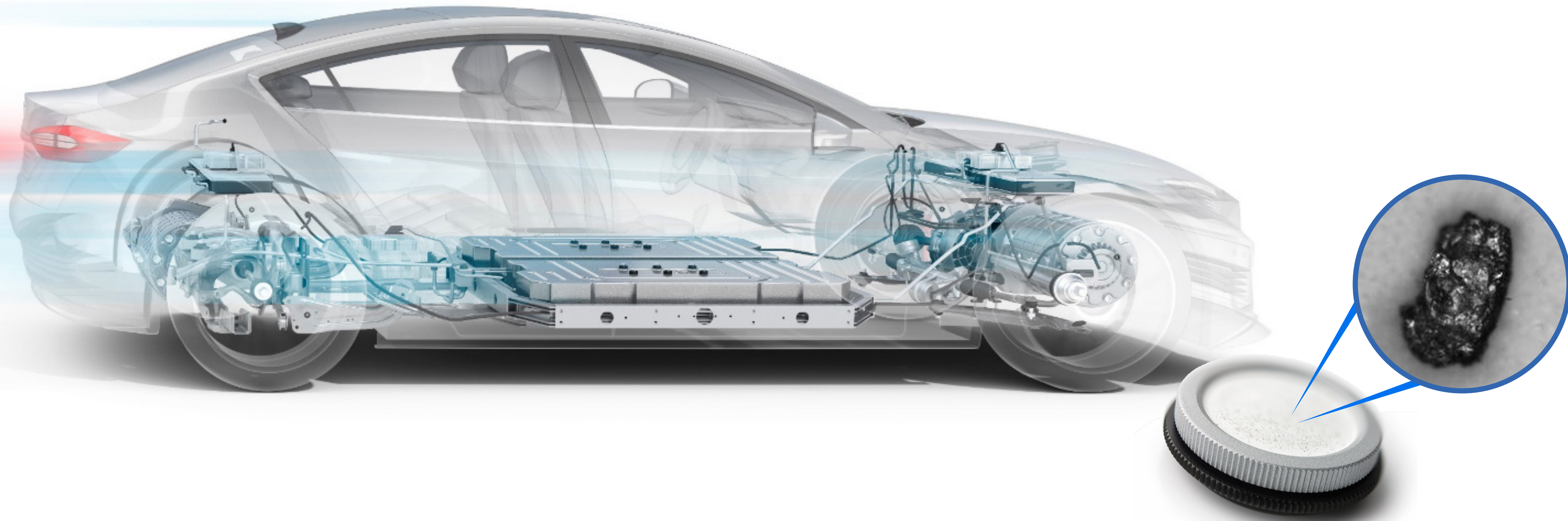


ZEISS eMobility Solutions



Seeing beyond

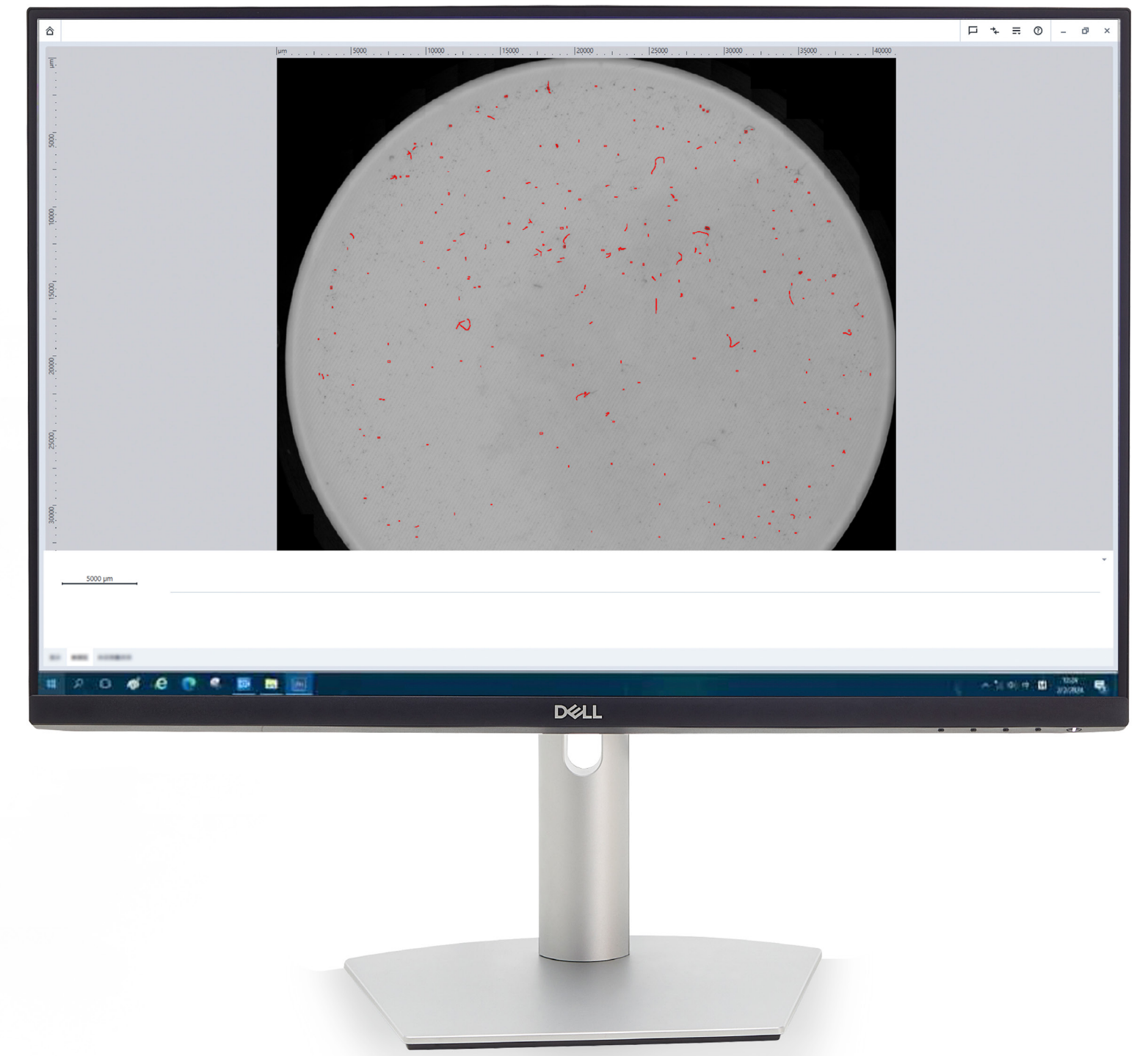
Battery Technical Cleanliness Assurance by Light Microscope



High-speed & high-resolution fully Automatic cleanliness microscope TCA by LM (Axio Zoom V16)

Technical Cleanliness Assurance (TCA) is critical in battery manufacturing for electric vehicles and energy storage systems, as even microscopic contaminants can severely impact performance and reduce lifespan. Key challenges include enforcing strict cleanliness standards, managing various contamination sources throughout production, and scaling manufacturing processes without compromising quality. Contaminants such as metallic particles, fibers, and dust - introduced during stages like raw material handling and assembly - can pose risks like internal short circuits and efficiency losses.

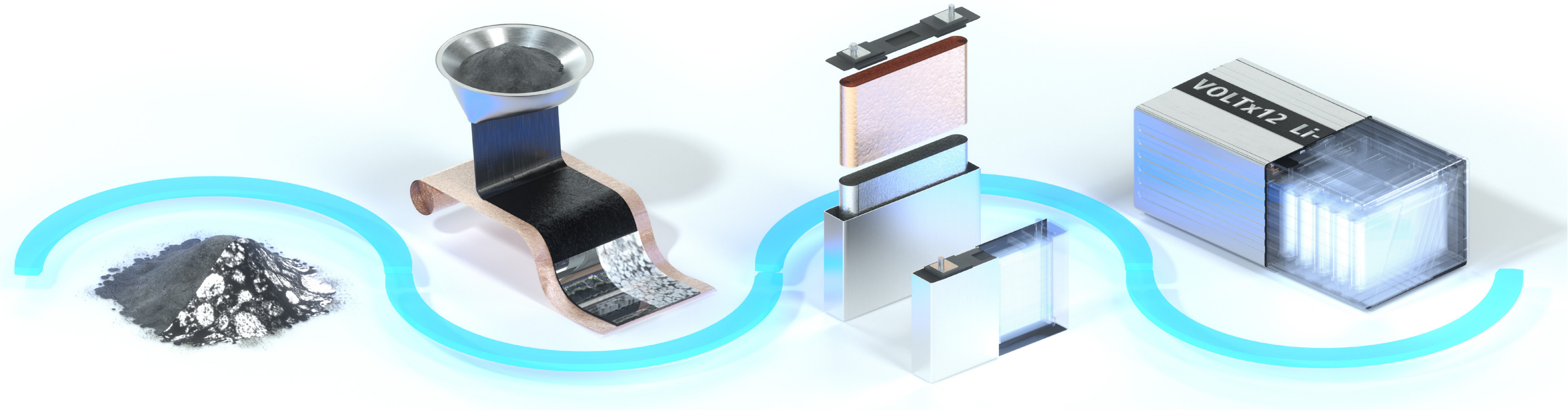
Light Microscope (LM) plays a critical role in TCA by enabling precise detection and analysis of microscopic contaminants, vital for maintaining battery performance and meeting regulatory standards. The ZEISS V16 fully automated TCA solution enhances this process by integrating advanced microscopy with automation, improving detection precision and efficiency. This system quickly identifies and documents contaminants, ensures consistent cleanliness across productions, and minimizes human error, crucial for scaling high-quality battery manufacturing to meet increasing demands.



Ensuring quality for NEV production from R&D to production

Monitored by TCA

Technical Cleanliness Assurance (TCA) is critical throughout the entire battery production process, from the precise manufacturing of battery cells to the final system assembly. Strict cleanliness control is essential, as even microscopic contaminants can compromise the efficiency, safety, and durability of the battery.



R&D and production process evolution of battery

Step 1
New material demand

Step 2
Material synthetic methods

Step 3
Single material evaluation

Step 4
Small cell performance

Step 5
NEV cell performance

Step 6
Commercialization

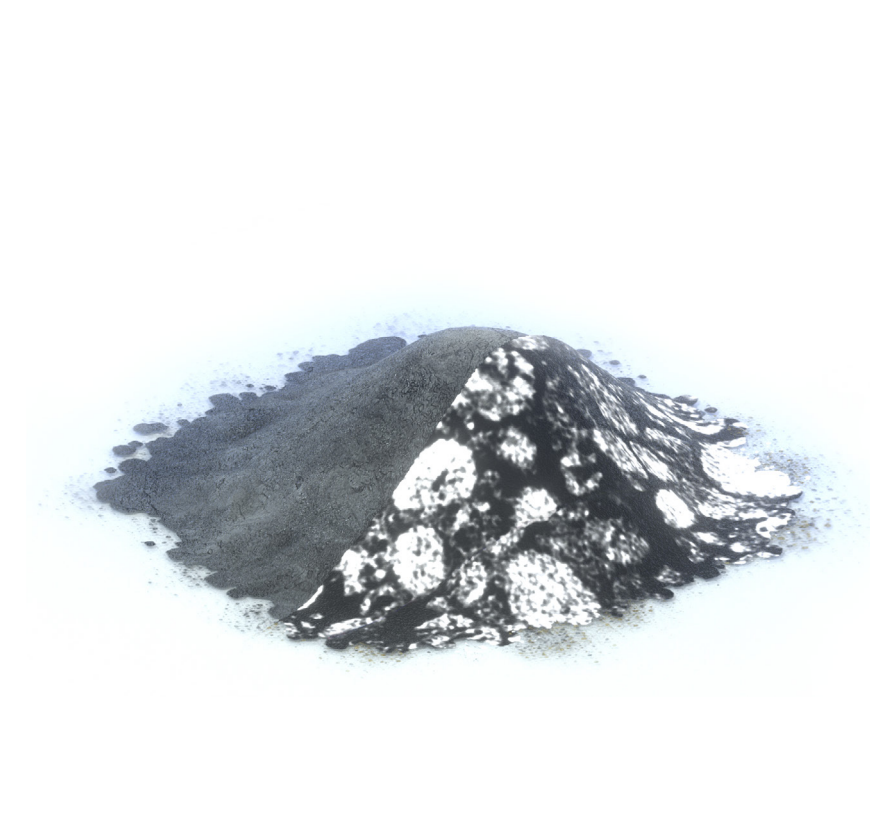
It is necessary to develop new battery materials with enhanced electrochemical performance, higher safety, and cost-effectiveness to fulfill customer demands.

TCA is needed everywhere throughout battery production

Inspection area:

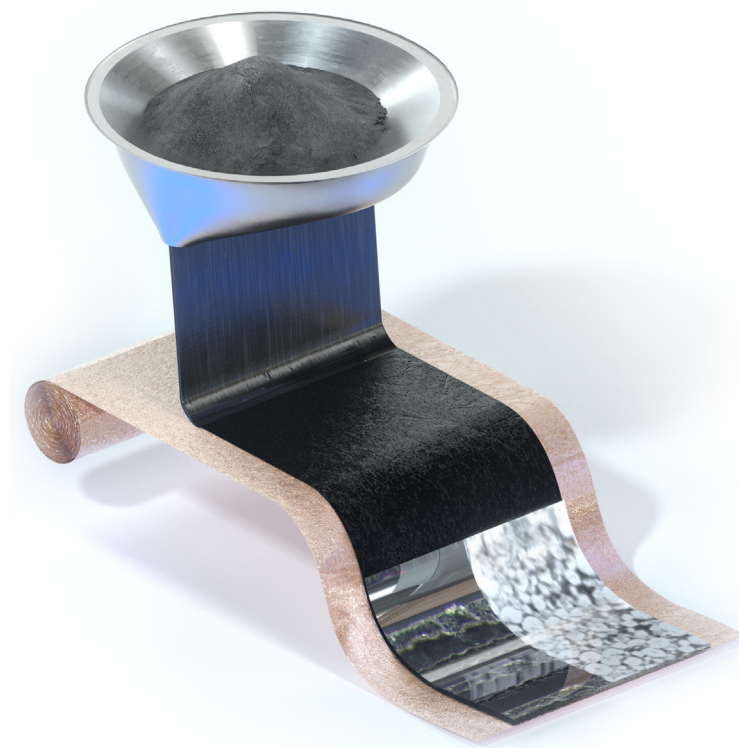
1. Foreign particle cleanliness assurance of incoming raw material
2. Electrode cleanliness assurance
3. Battery housing cleanliness assurance
4. Production line cleanliness assurance

Application areas of LM TCA in NEV battery production



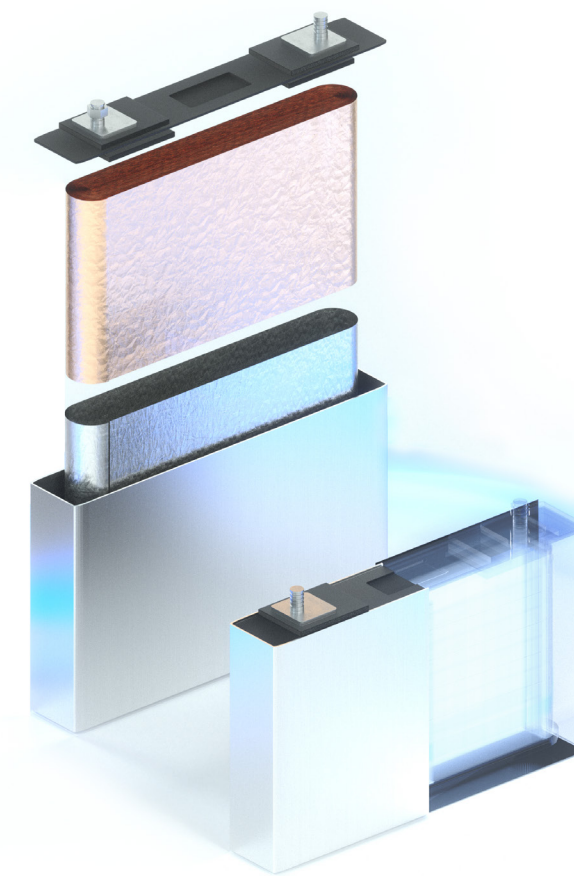
Raw material cleanliness inspection

- Raw material spot checks to ensure incoming cleanliness and purity



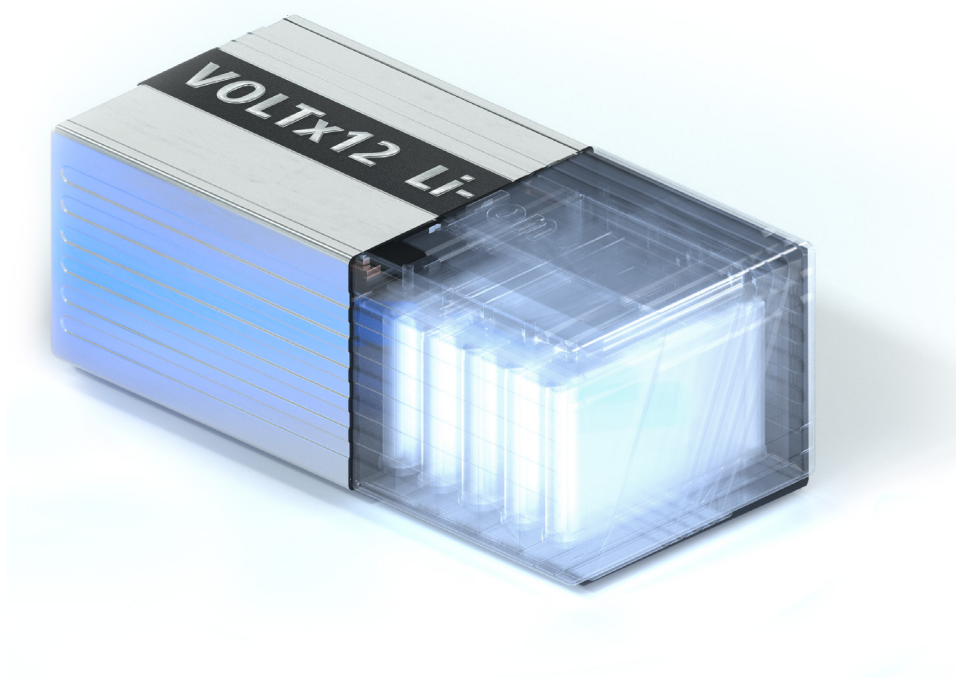
Electrode foreign particle inspection

- Electrode spot checks to ensure the cleanliness of the electrode surface and detect safety hazards



Battery components cleanliness inspection

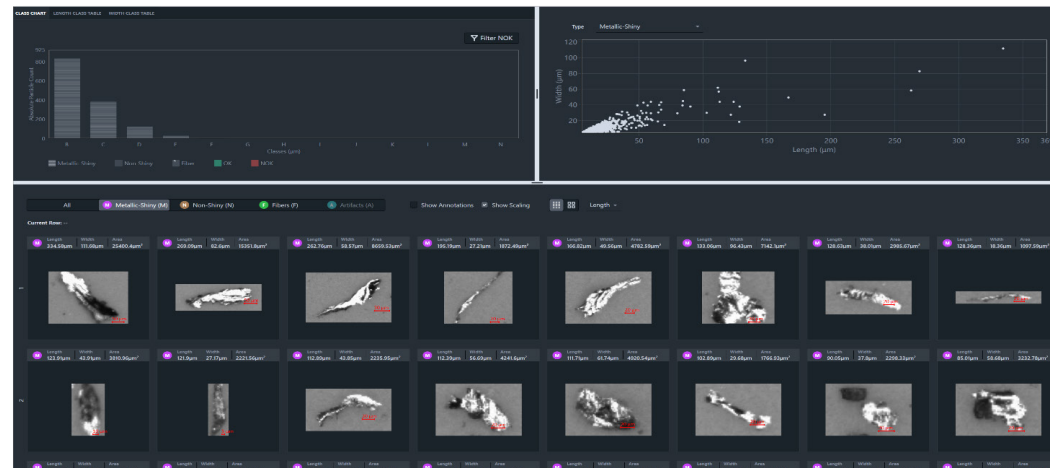
- Battery component spot checks to ensure that the cleanliness of battery housing meets standards before assembly



Battery production line cleanliness inspection

- Production line environmental testing to ensure the cleanliness of the production line environment for production protection

Value proposition of ZEISS solution



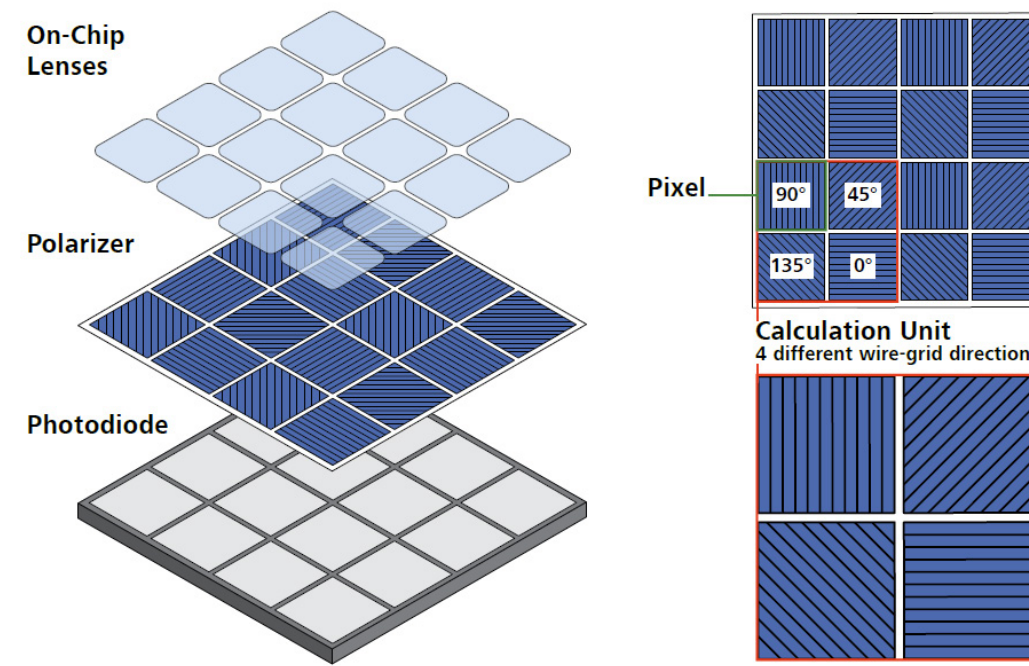
Turn-key operation

- Fully automated system
- Novice user friendly
- Highly decrease human-error

<input type="checkbox"/>	ISO 16232	2018	Extended Analysis	User
<input type="checkbox"/>	ISO 16232	2018	Standard Analysis	User
<input type="checkbox"/>	VDA 19.1	2015	Extended Analysis	User
<input type="checkbox"/>	VDA 19.1	2015	Standard Analysis	User
<input type="checkbox"/>	VDI 2083, Blatt 21	2019	Standard Analysis	User

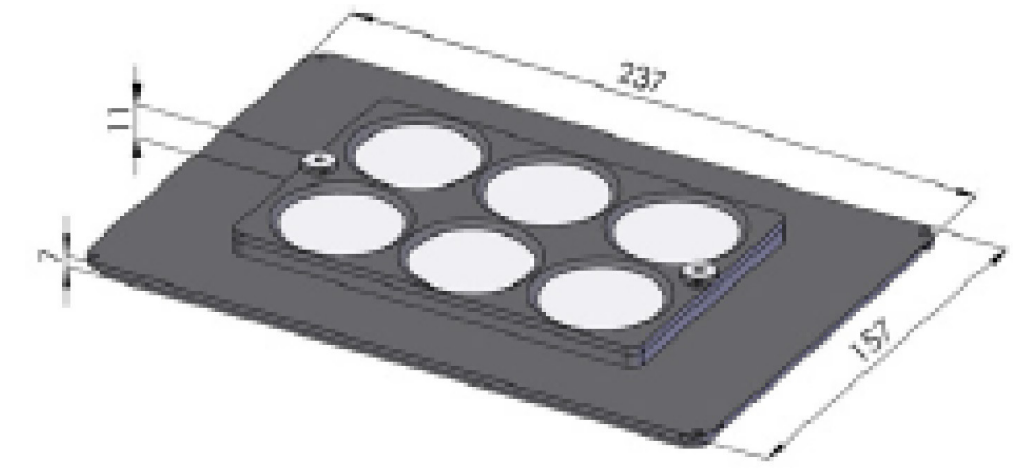
TCA standard choices

- Incorporate a wide range of commonly used cleanliness standards in the TCA workflow
- Enable customized evaluation standards for the battery industry by the standard editor



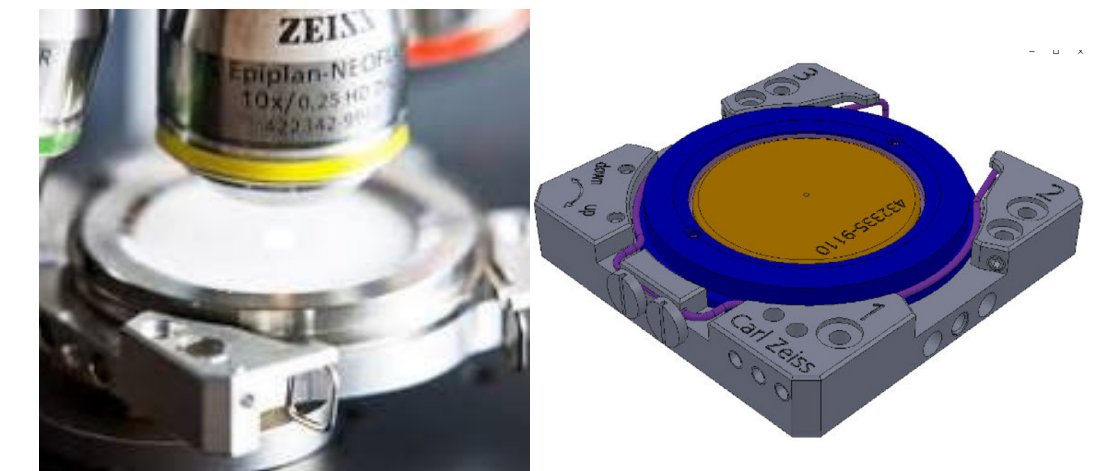
High efficiency

- Reduce the required number of scans from two to one, improving efficiency by over 30%, with the patented new "One-Scan" polarization technology



Multiple and customized holder types

- One-click to analyze up to six standard filters
- Customized analyzation regions



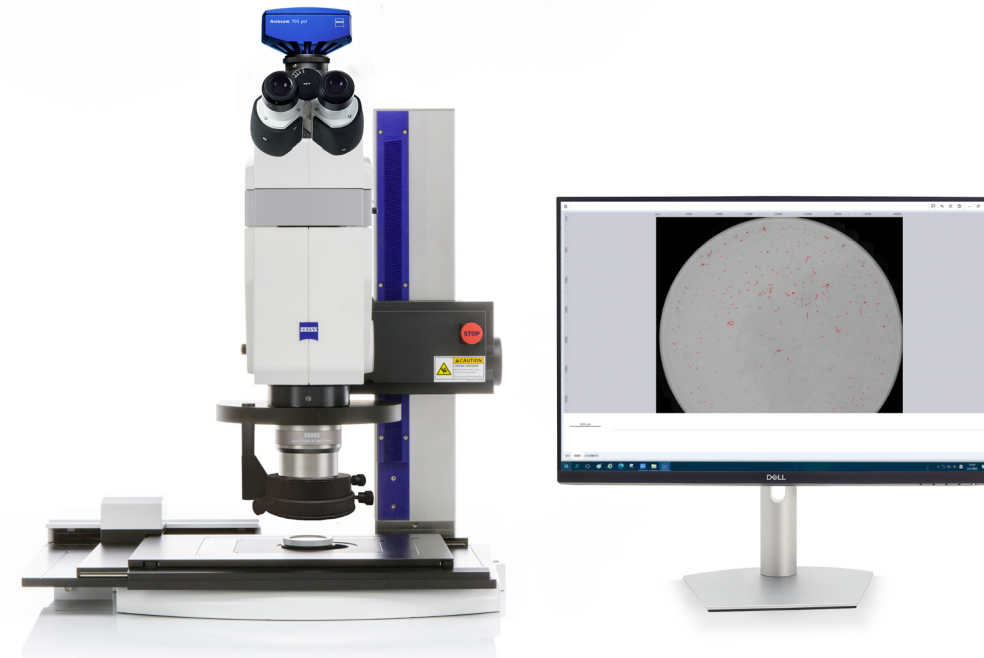
Correlative LM-EM

- Seamlessly integrate the optional correlative particle analysis (CAPA) workflow with ZEISS electron microscopes, enabling particles identified under the light microscope to be directly traced and analyzed directly through the electron microscope

Recommended portfolio

Automated digital microscope

ZEISS Axio Zoom.V16



Resolution

- 0.7 – 5.0 μm with PlanNeoFluar Z 1.0x
- 1.3 – 10.0 μm with PlanApo Z 0.5x
- 0.4 – 3.3 μm with Apo Z 1.5x

Magnification

- 7x – 112x with PlanNeoFluar Z 1.0x
- 10.5x – 168x with PlanApo Z 0.5x
- 3.5x – 56x with Apo Z 1.5x
- Electrically adjustable Magnification with continuous zoom and auto focusing

Sample stage

- Fully motorized stage with sample holder holding up to 6 standard filters

Benefits:

- Fully automated workflow
- Various sample holder options
- Patented “One-Scan” technology, saving 30% image capture time
- ZEISS high-quality optical performance

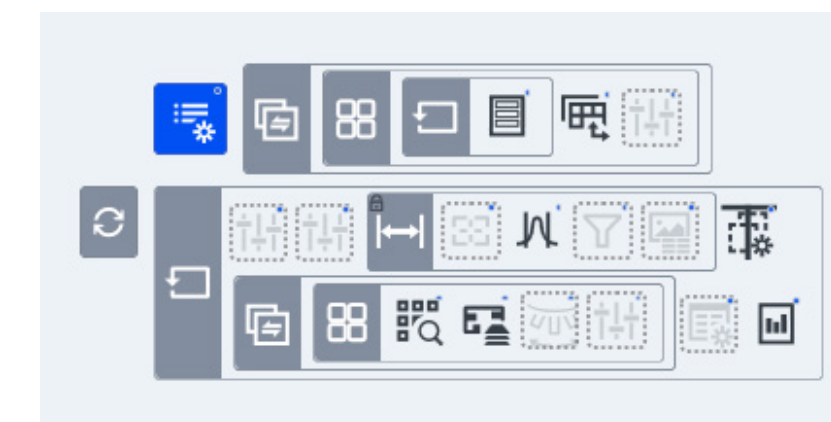
Software solutions

ZEISS Quality Software provides versatile and high-precision analysis capabilities. Based on specific requirements, customers can conduct data evaluations and generate reports across various technologies and systems.



ZEN core

ZEN core is the command center for automated imaging and analysis functions on compound light microscopes. Use built-in automated image acquisition routines and benefit from the consistency of an advanced and repeatable workflow.



TCA automated workflow

The TCA fully automated workflow, powered by ZEN core, provides customers with a seamless one-click operation. It includes automated particle detection, classification, and extraction without manual intervention, significantly improving efficiency.



LM-EM Correlative Analysis

The automated correlative particle analysis (CAPA) integrates data from both optical and electron microscope, enabling seamless correlation of analytical data. This approach allows for the identification of critical particles in a streamlined workflow.

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Sales & Service
Organizations

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Quality
Excellence
Centers

11
Locations

245
Sales Partners
Worldwide

Global Metrology Network

Our global service network provides easy access to ZEISS expertise around the world. We use local teams to ensure a swift response and reduced downtime. Make your operations even more secure and reliable with ZEISS.

Find your perfect solution today.
Contact our global experts.

