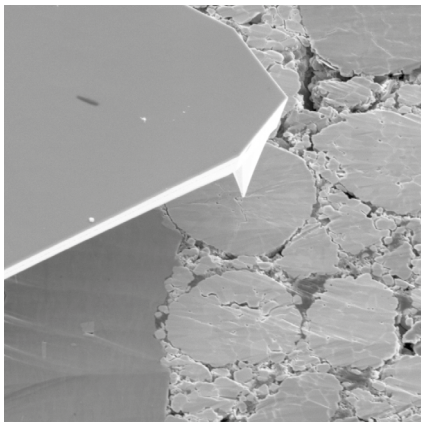
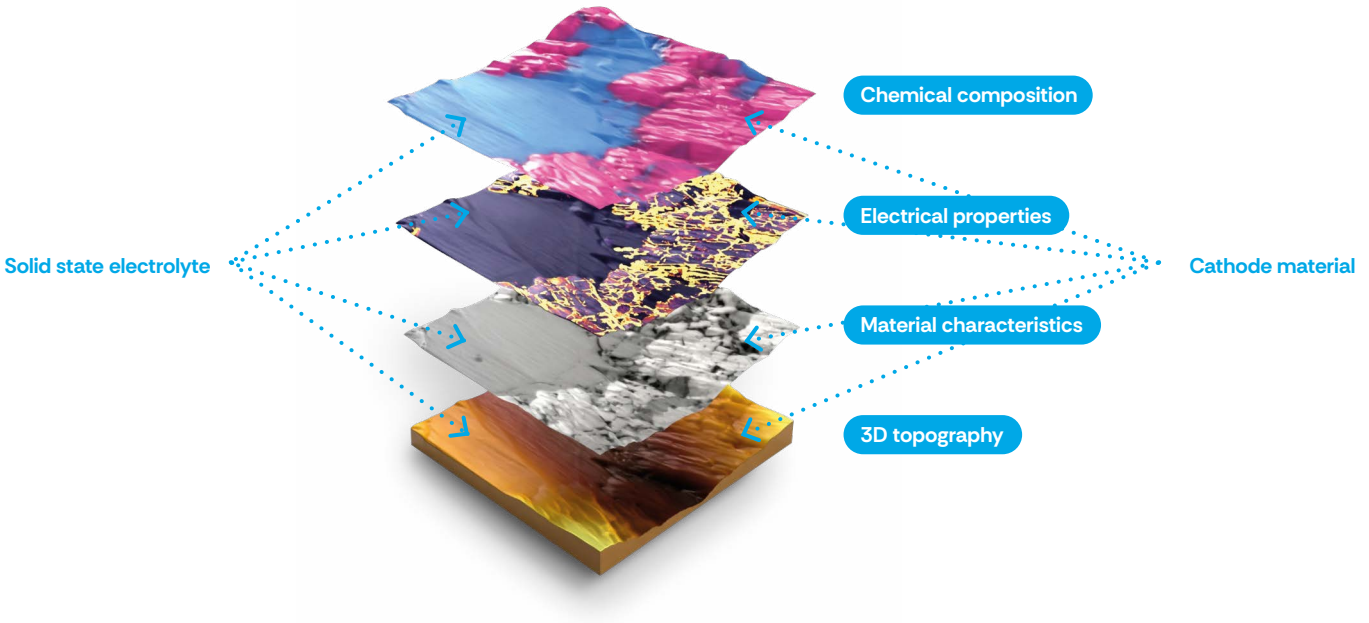
# NenoVision

## Battery research: Cathode Tape Inspection using AFM-in-SEM LiteScope™

- Site-specific local resistivity of individual particles
- In-situ performance and degradation of battery components
- No air exposure of sensitive surfaces
- Complementary to SEM analytical capabilities (FIB, EDX, etc.)

**Measurement modes:** C-AFM, AFM, SEM, EDX

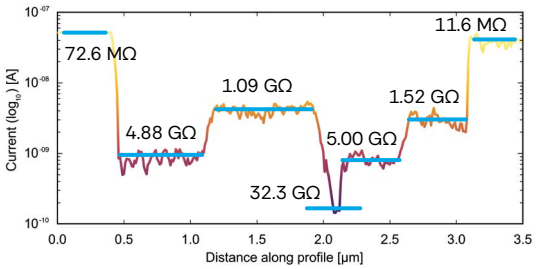




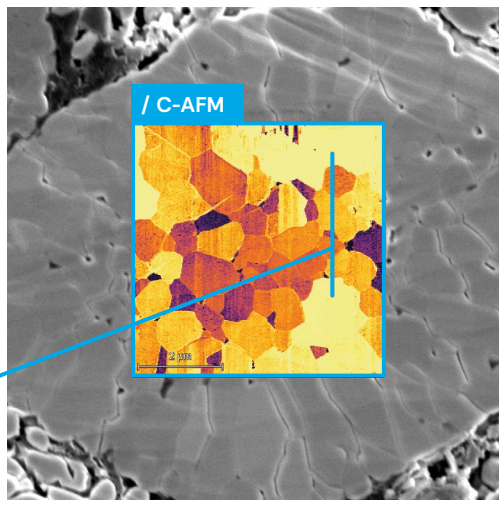

## IntraParticle connectivity

SEM imaging identifies the specific particle, C-AFM provides a complex conductivity distribution inside the secondary particle.

/ Current profile with calculated resistivity




/ SEM

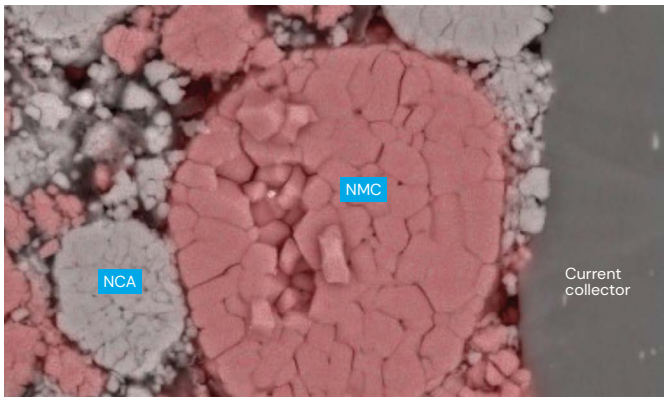


## Analysis of cathodes composed of multiple active materials

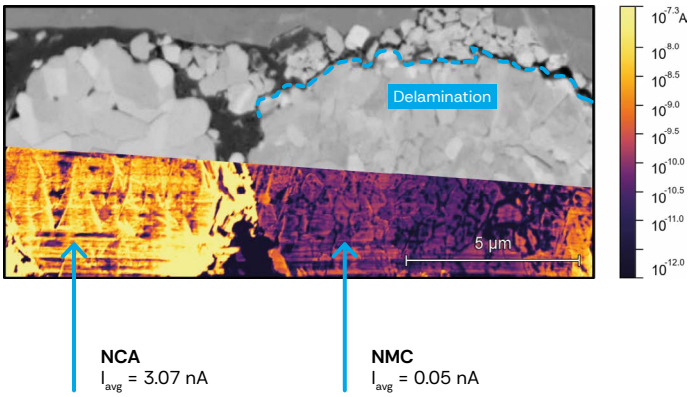
Material composition by EDX mapping identifies the type of grains (NCA and NMC).

Electrical properties characterization by C-AFM revealed a 3 OOM conductivity decrease in NMC grain, indicating that the grain was delaminated and its connections significantly weakened.

/ SEM + EDX (Mn)

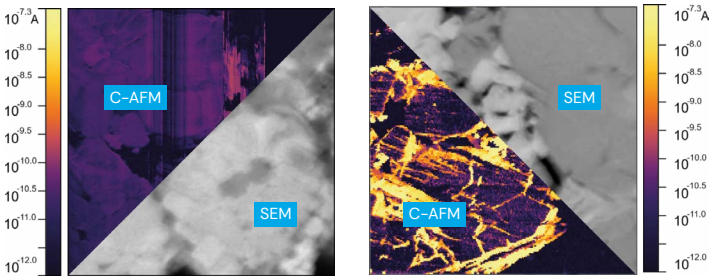



/ SEM + C-AFM




## Cathode degradation: Impact of cycling on cathode active material

AFM-in-SEM conductive analyses of pristine and 200-cycled cathode tape unravel local resistance changes.




**Low**, homogeneous conductivity

**High**, localized conductivity on the edges of the grains

## AFM LiteScope with Sample Transfer Module

- Transfers the samples safely with no air exposure
- Compatible with leading SEM Inert atmosphere sample transfer systems and custom load-lock solutions

ThermoFisher SCIENTIFIC

Quorum

AFM-in-SEM solution