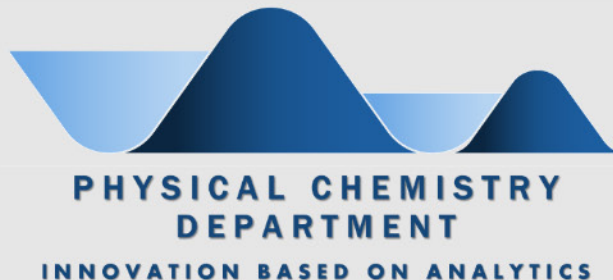


# EXPERTICE IN THE RESEARCH FOR LITHIUM ION BATTERY RECYCLING

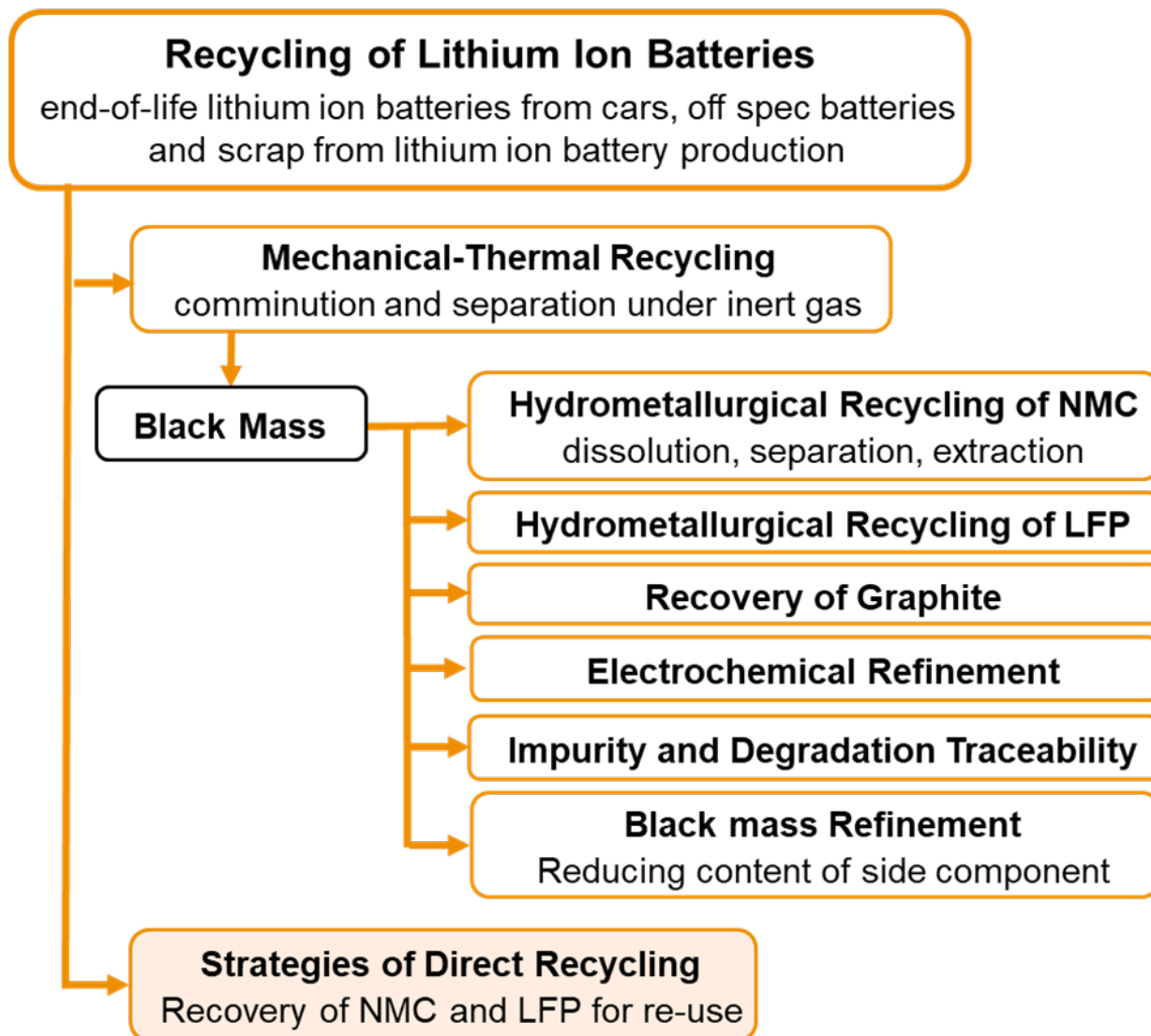


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<https://www.b-tu.de/fg-physikalische-chemie/>

## Fields of Expertise



## Fields of Activity

### Industrial Recycling

material flow balances for optimization:  
analysis of material fractions after each process  
step, e.g. exhaust gases, dust fractions, process  
chemicals, impurities, carry-over of material  
development of new process steps

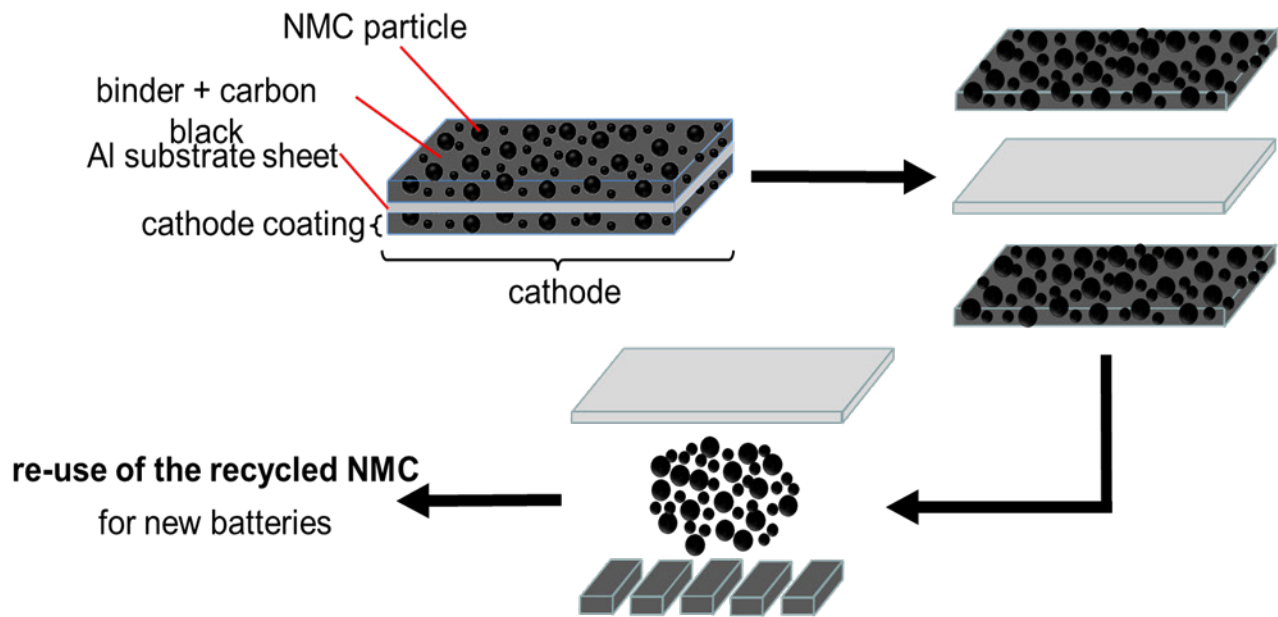
### Fundamental Research

study of degradation processes during deep  
discharge, comminution or opening of cells and  
during recycling  
new approaches to recycling

### Chemical Analytics

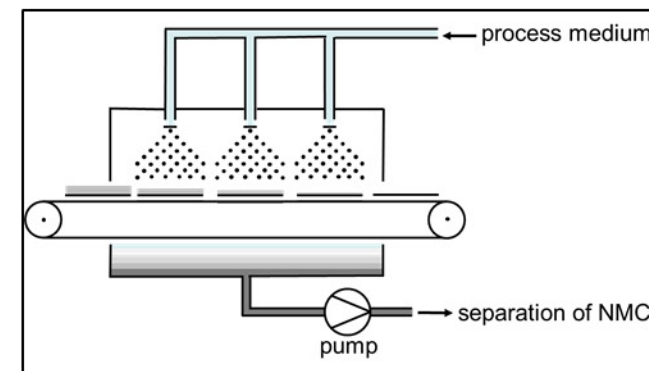
materials analysis: spectroscopy, microscopy,  
electrochemistry, particle analysis  
High-precision chemical analytics  
analytical methods suitable for industry

**Functional recycling:**  
Recovery of a material while maintaining its chemical and physical functionality.

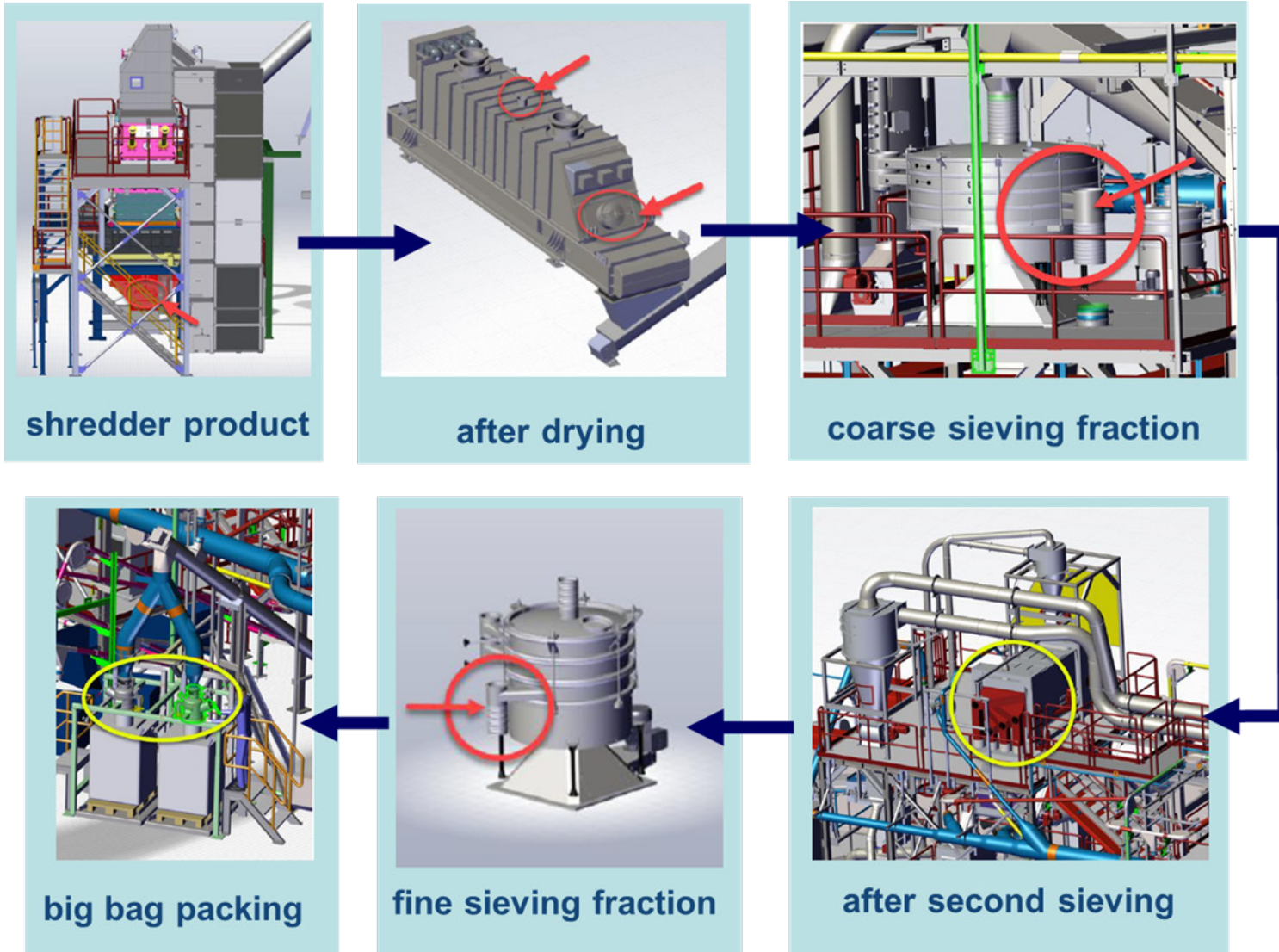


Recycling capacity: 1500 metric tons per year  
Recycling efficiency: > 95%  
CO<sub>2</sub> savings with NMC reuse : up to 18% \*

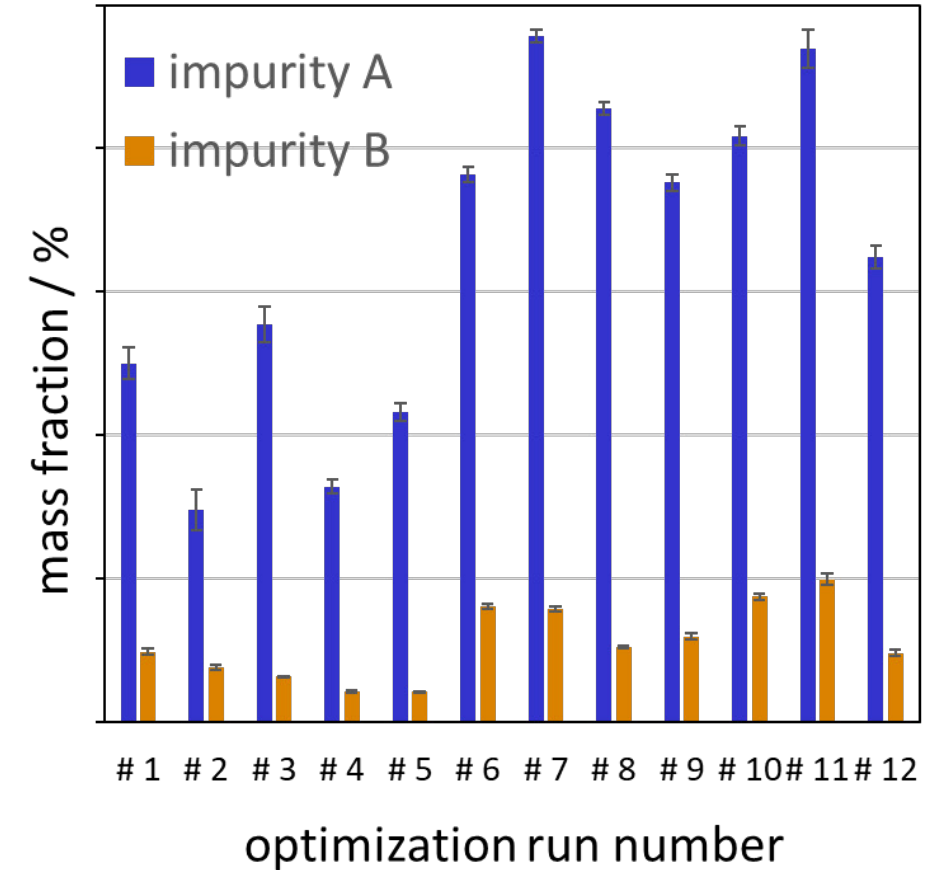
## World's First Functional Recycling Line



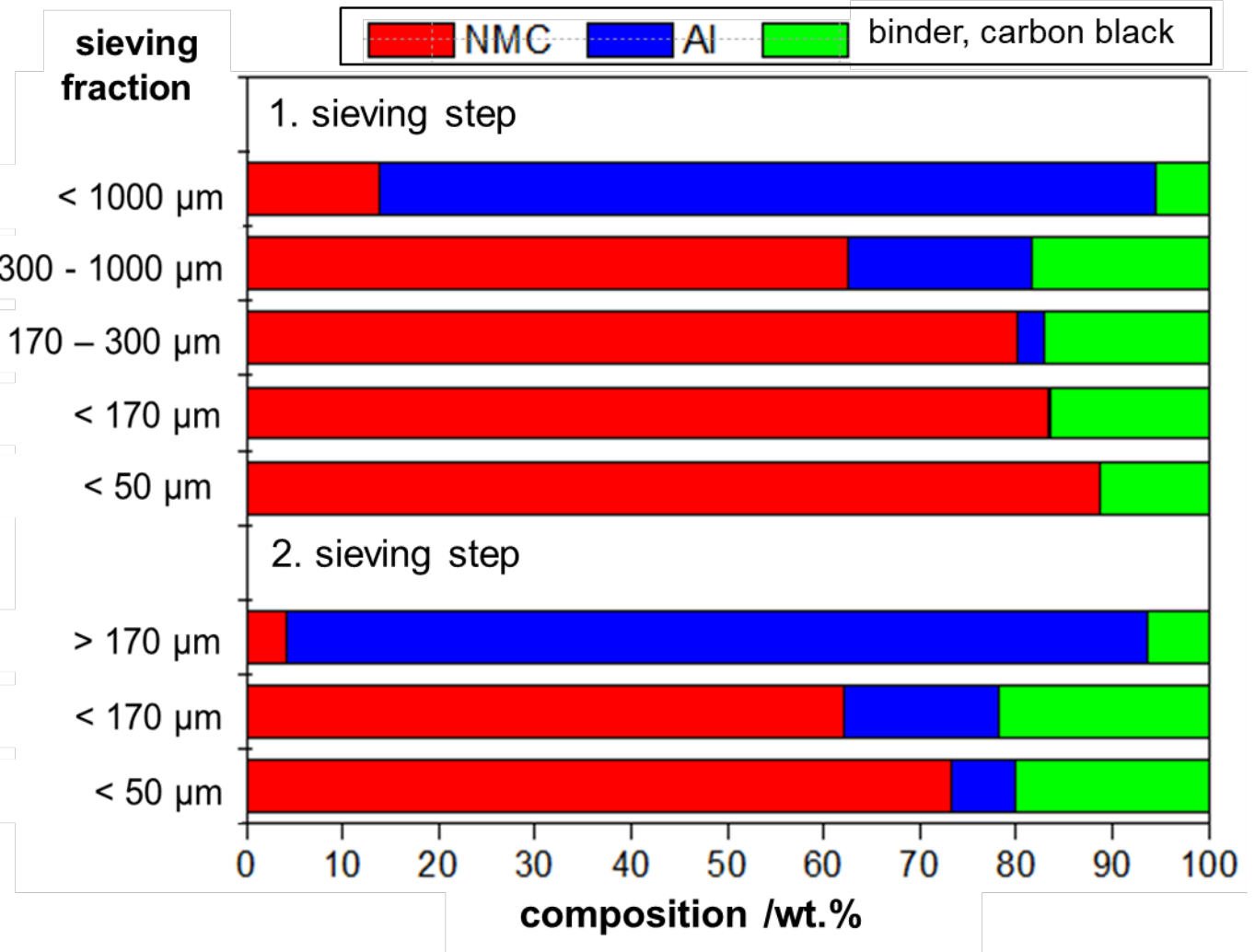
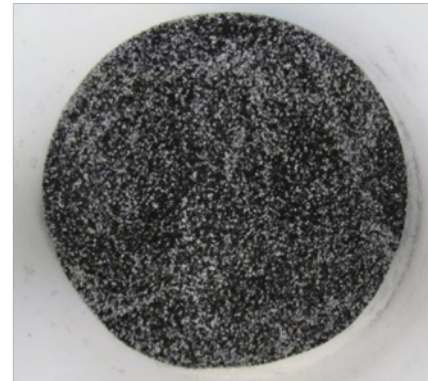
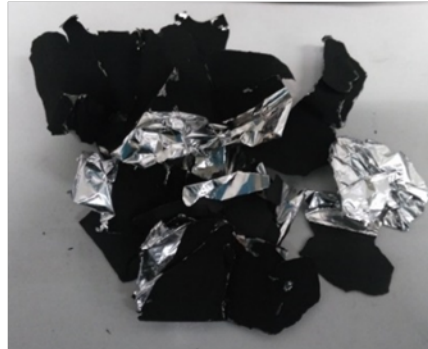
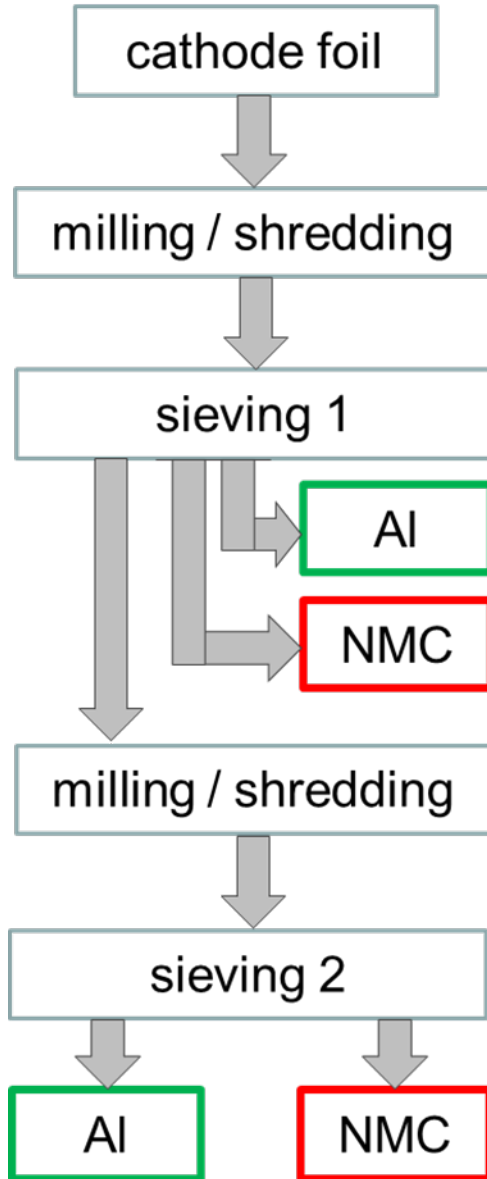
# STEP-BY-STEP ANALYSIS OF INDUSTRIAL RECYCLING: MONITORING AND TRACKING OF IMPURITIES



## Monitoring and tracking of impurities



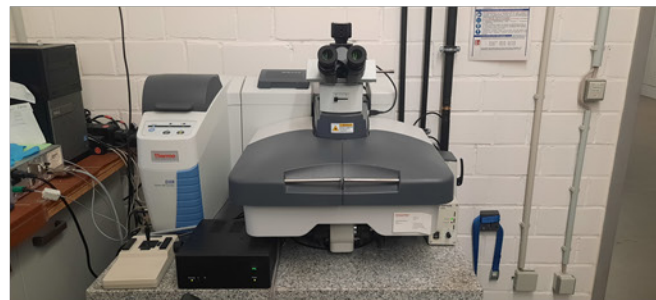
# MECHANICAL PROCESSING OF CATHODE MATERIAL: RECYCLING OF OFF-SPEC CATHODE SHEET ROLLS



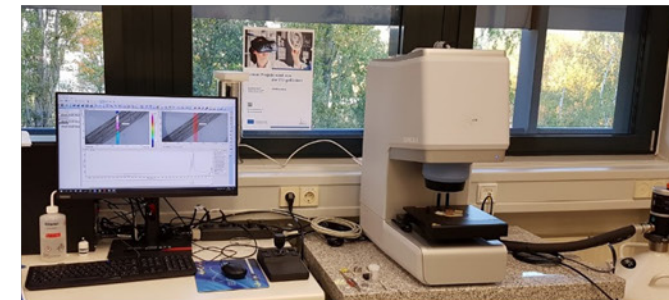
## Analytical Techniques

high-precision compositional chemical analytics by ICP-OES, ETV, CS-AAS; ion chromatography, gas chromatography, mass spectrometry, infrared spectroscopy and infrared microscopy, Raman spectroscopy and Raman microscopy, confocal microscopy and interferometry, surface topography analysis, scanning electron microscopy incl. EDX and EBSD, thermal analysis, particle analysis, all electrochemical techniques

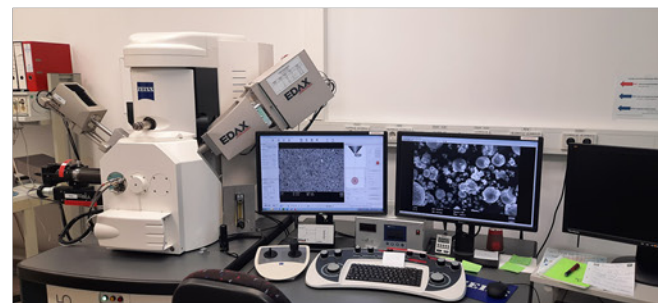
## Raman microscopy



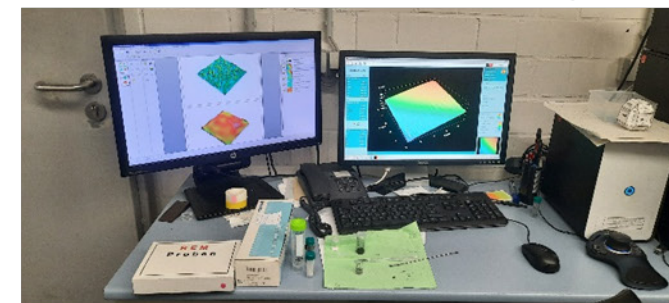
## Infrared microscopy



## SEM-EDX-EBSD



## Confocal microscopy



## ICP-OES



## Sample Preparation

