



Entwicklung und Produktion von Li-Ionen Batterie Materialien

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Materialinnovationen für die Dekarbonisierung des Verkehrs,

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European LIB Landscape

Announced LIB cell manufacturing:

2025: > 400 GWh

2021: > 100 GWh



As a global leader for cathode materials, Umicore supports this significant growth by innovative material solutions and setting-up material pipeline in EU

A global leader in active materials for rechargeable batteries



Last year Umicore produced enough cathode materials to...

....provide a smartphone to every person on this planet



...power more than 1 Million EV's



1 out of 5 batteries ever made contains Umicore technology



Over 20 years in the market



6 production sites

RBM production footprint

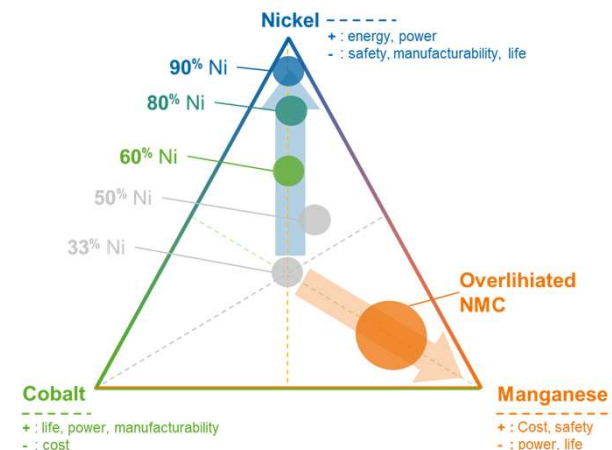


Material technologies

Wide range of NMC material needed to meet requirements

Umicore's contribution:

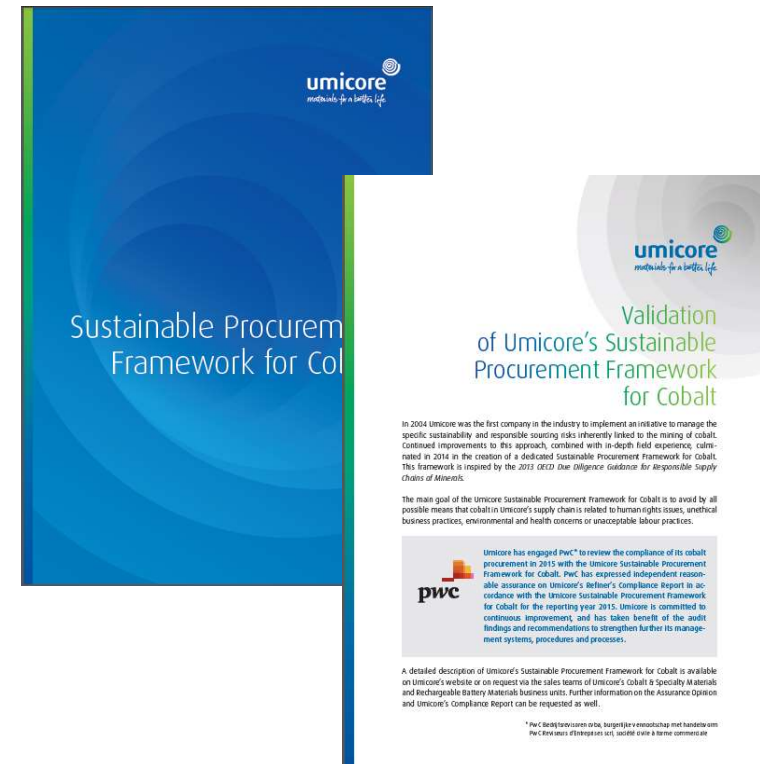
- Successful product development and qualification of the Ni 60+% and Ni 80+% NMCs
- Next generation of very high Ni NMCs (towards Ni 90%) in development
- New NMC morphology developed and introduced → “monolithic” NMC (both medium and high Ni version)
- NMC development dedicated for higher cut-off voltages
- Beyond layered NMC, energy density gains (and further cost reduction) will have to come from other chemistries such as overlithiated metal oxides
- Material development towards SSB application



Ethically sourced materials

Sustainable Procurement Framework for Cobalt

- Umicore has developed a good understanding of the risks related to the handling and sourcing of cobalt, including:
 - **Health** and safety
 - **Environmental** concerns related to mining operations
 - Concerns related to **bribery and corruption** in the supply chain
 - Risks related to engagement with **communities** (including forced resettlement)
 - Risks related to human rights
 - **Geopolitical risks**
- Engage with those suppliers who demonstrate operating with the highest standards
- Developed its **Sustainable Procurement Framework for Cobalt** (Inspired by OECD's 5-steps process)
- **Umicore received as first company ever third-party validation for its cobalt due diligence practices**



Ethically sourced materials

Recycling is Must! Umicore's Recycling of Li-Ion-batteries is up and running



Umicore's (pilot) industrial process with 7000 t/y capacity*



*capacity is sufficient to treat:

± 250 mio mobile phone batteries

± 35,000 EV's

Umicore combines Pyro & Hydro technology to recycle and refine the module
→ **Metals are recovered in battery grade quality!**

Key takeaways

High Ni NMC materials essential element in current development

High-voltage stable medium Ni materials still offer an alternative

Monolithic NMC materials have special advantages but must be considered carefully with regard to cell design

Umicore uniquely positioned with its cathode materials to capture significant growth in electrification segment:

- Full spectrum of highest quality active materials
- Process technology and ability to scale up fast
- Global footprint – production close to customer (@ gigafactory scale)
- Sustainable metal supply with high flexibility
- Battery recycling as feed for production



umicore
Rechargeable Battery Materials

materials for a better life