Mobility Transformation

Rechargeable Battery Materials: Capture profitable growth and create sustainable value

Ralph Kiessling
Agenda

1. Mobility transformation driving accelerated demand for cathode materials

2. Rechargeable Battery Materials well positioned to capture profitable growth and create sustainable value in fast-growing market

3. RISE 2030
Electrification increasing at fast pace, triggered by regulatory push and OEM commitments

### Light-duty vehicles
Proportion by powertrain in global car production

<table>
<thead>
<tr>
<th>Year</th>
<th>BEV</th>
<th>FC</th>
<th>PHEV</th>
<th>ICE only</th>
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<tbody>
<tr>
<td>2021</td>
<td>5%</td>
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<td>2022</td>
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<td>2024</td>
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<tr>
<td>2025</td>
<td>15%</td>
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<tr>
<td>2026</td>
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<tr>
<td>2030</td>
<td>25%</td>
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### Medium- and Heavy-duty vehicles
Proportion by powertrain in global car production

<table>
<thead>
<tr>
<th>Year</th>
<th>BEV</th>
<th>FC</th>
<th>PHEV</th>
<th>ICE only</th>
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<tr>
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<tr>
<td>2030</td>
<td>20%</td>
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Sources:
- Umicore market model
- BEV: battery electric vehicle
- FC: fuel cell vehicle
- PHEV: plug-in (hybrid) vehicle
- ICE: internal combustion engine (gasoline/diesel) only
- CNG/LNG: Compressed natural gas / Liquefied natural gas
Umicore chemistries addressing ~75% of total Light-duty EV CAM demand

Global CAM demand (GWh)
LDV only – Chemistry split

~25% CAGR

Source: Umicore market model

Evolving technologies reflecting car OEMs’ need for performance- and cost-focused solutions

NM(C) chemistries (incl. Mn-rich) represent vast majority of EV CAM demand in 2030

Solid-state batteries expected to gain traction based on NMC, with a single digit market share expected towards 2030

Source: Umicore market model
>20% annual market growth across all regions

CAM demand (GWh) across regions LDV only

Europe, China and North America expected to represent ~90% of total LDV CAM demand

Ongoing regionalization of supply chain:
- Geopolitical context
- OEMs’ sustainability considerations
- Security of supply

Source: Umicore market model
Agenda

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Cathode active materials crucial for the mobility transformation …

CAM critical component determining electrification success

Key technological lever for battery performance

Biggest single contributor to overall battery cost

Critical driver of long-term cell technology strategy
… requiring critical competences and skills for CAM producers to succeed

**Product**
- High performance and quality product with customized end specs
- Joint development with customers and partners
- Strong technology and IP portfolio and continuous innovation

**Process**
- Mastering complexity and flexibility of production process
- Continuous industrialization and process innovation
- Extensive quality and purity control

**Supply**
- Strategic access to raw materials – low carbon intensity, highest ESG requirements
- Metal refining expertise enhancing supply flexibility
- Regionalized production footprint along value chain

Ample opportunities for differentiation and gaining advantage over competitors
Capture profitable growth and create sustainable value

Where to play

Extend leadership in Europe
Leverage strong first-mover advantage with long-term customer partnerships as cornerstone for growth

Enter North America with local production
Establish local presence in North America based on customer qualifications and platforms awards
Acquire land and build footprint for greenfield construction in North America

Reinforce market position in Asia
Strengthen position by further diversifying customer and platform exposure
Ramp up production plants in China and Korea towards full capacity as of 2024, based on customer demand indications

How to win

R Reliable Transformation Partner
I Innovation & Technology Leader
S Sustainability Champion
E Excellence in execution
Capture profitable growth and create sustainable value

VALUE CREATIVE STRATEGIC PARTNERSHIPS ACROSS THE VALUE CHAIN

- Long-term OEM relationships and understanding
- Deeply embedded customer centricity
- Strategic partnerships and global footprint in fast-changing EV battery ecosystem
Mobility transformation radically accelerating
Uniquely positioned to help the world transition to cleaner mobility

ICE equipped vehicles will be the dominant clean mobility drive train for the next 10+ years

Internal Combustion Engine
Emission control catalyst

Plug-in Hybrid Electric Vehicle
Battery active materials and emission control catalysts

Full Electric Vehicle
Battery active materials

Fuel Cells Vehicle
Electro-catalyst and battery active materials

Prime electrification path for light transportation
Prime electrification path for heavy transportation
Supporting customers on the path to electrification, right from the start


- Start research in Hi-Ni CAM
- First NMC materials synthesized and tested
- First large scale NMC sale to automotive market (EV)
- Acquisition refining and pCAM in Finland
- Long term supply agreements with LG and SDI
- Long term supply agreement with ACC
- New global R&D center in Korea

1995-2015

- Supporting our customers from the start
- Longstanding track record in CAM technology with integrated business model including upstream integration
- Vast experience in producing at scale

Since 2016

- Accelerating with our customers
- Continuously pushing product and process technology
- Accelerated expansion of CAM/pCAM production footprint and upstream refining capabilities
Strategic partnerships key to accelerate decarbonization and electrification

Building **profitable and long-term strategic partnerships** with customers along the value chain

Aligning on **leading sustainability standards as well as technology and capacity roadmaps**

Recent examples

- JV intention with Volkswagen
- Long-term agreement with ACC
- ... and further opportunities being discussed

**Long-term partnerships enhancing value for Umicore through:**

- Secured long-term customer demand
- Valorization of technological innovation and industrial know-how, while protecting critical IP
- Collaboration along entire value chain
- Shared investments and value creative for both partners
Upstream know-how and integration closing the loop

Supporting customers from upstream sourcing to manufacturing and recycling

- Raw materials
- Refining & Leaching
- Precursor & Cathode active materials
- Recycling

Providing our customers sustainable sourcing and guaranteed supply of critical materials
Expanding our global manufacturing and R&D footprint along the value chain, close to customers.
Transformational growth serving our customers in all regions

Expanding our global manufacturing footprint 2022-2030

Umicore CAM capacity forecast

> 400 GWh

<table>
<thead>
<tr>
<th>Year</th>
<th>Ambition</th>
<th>Vision</th>
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<tbody>
<tr>
<td>2021</td>
<td>65 GWh</td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>230 GWh</td>
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</tbody>
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Footprint expansion
- North America
- Europe
- Asia
Capture profitable growth and create sustainable value

TECHNOLOGY & IP PORTFOLIO COVERING PERFORMANCE & COST

- Broad technology portfolio covering design-to-performance and design-to-cost applications
- Next generation technologies with solid-state battery cathodes and catholyte materials gaining traction
Broad technology and IP portfolio covering current and future’s chemistry spectrum

<table>
<thead>
<tr>
<th>ENERGY DENSITY</th>
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**Short- to medium-term**

**Design-to-Performance**
Hi-Ni (Ni80+, low Co)

**Design-to-Cost**
- Med-Ni (HV, low-zero Co)
- Mn-rich

**Medium- to long-term**

**Design-to-Performance**
NMC cathodes / catholytes for SSB

**Design-to-Cost**
- Si-anode
- S-based cathodes
- Na-ion cathodes
- Ni-/Co-free (DRX)

Source: Umicore
Note: Hi-Ni = High Nickel; Med-Ni = Medium Nickel; Mn-rich = Manganese-rich; DRX = Disordered Rock Salt
Complete portfolio for performance and cost on short- to medium-term

Umicore fully on par with key competitors in design-to-performance Hi-Ni; technology leader in design-to-cost med-Ni and Mn-rich applications

Note: Hi-Ni = High Nickel; Med-Ni = Medium Nickel; Mn-rich = Manganese-rich
Manganese-rich/HLM technology portfolio for design-to-cost

Manganese-rich/HLM technology offering best of both worlds …

… NMC-like technological advantages …
✓ High energy density
✓ Fast charging suitability
✓ High recycling potential
✓ Global supply chain

… and LFP-like comparable cost
✓ Cost competitiveness ($/KWh)

“High-manganese represents the optimum cost-benefit ratio.”
Volkswagen, March 2021

Li-Mn-rich technology shown as “cost” solution in electrification roadmap.
BMW, November 2021

Tesla is working on new manganese battery cell.
Tesla, March 2022
Leader in next generation performance technologies – Zoom in on Solid State Batteries

**Design-to-performance**

SSB cathode
Staged approach depending on electrolyte technology

**R&D / qualifications**

**Start of customer supply**

**Developing the right chemistry for SSB**

- Next to CAM, development of catholyte materials for SSB
- CAM and electrolyte materials chemically matched and pre-integrated

**Being a solution provider through partnerships**

- Strong collaborations and customer traction ranging from high-profile start-ups to OEM
- Partnerships with Idemitsu for catholytes
Capture profitable growth and create sustainable value

KEY PARTNER IN TRANSITION TO LOW CARBON MOBILITY

Pioneering responsibly-sourced materials increasing standards for Umicore and the industry

Becoming the driving force to decarbonize the battery value chain
Decarbonizing the battery value chain
Accelerating our journey towards net zero & transforming our rechargeable battery materials business

Scope 1: identifying and implementing energy efficiency improvements

Scope 2: Signing long-term PPAs Cathode plant in Poland to operate on 100% renewable electricity

Scope 3: Securing a supply of sustainable battery materials sourcing low-carbon Nickel & long-term supply agreements for zero-carbon Lithium

Umicore cathode materials prevented over 9.5 million tons of GHG emissions from being emitted in 2021

Considering recycling, production, processing into batteries and the use of batteries in full EVs
Decarbonizing the battery value chain
Becoming the leading supplier for low-carbon batteries

NMC carbon intensity, average kg CO$_2$e/kg NMC 811

- Estimated market average CAM footprint:
  - >30
  - 20
  - 8

Umicore NMC 811

2022
2030

Reducing the Umicore CAM carbon footprint by >50% compared to today’s levels

Recycling batteries to feed low-carbon and recycled metals into our cathode materials

Scope 3 reduction potential of >3 million tons CO$_2$e by 2030

Considering projected scope 1+2+3 emissions

Umicore 2030 RISE
Capture profitable growth and create sustainable value

STEP-CHANGE IN PROCESS, OPERATIONAL AND ORGANIZATIONAL EXCELLENCE

Continuous improvement delivered over last years

Set up for further operational optimization and innovation

Building organization of future for transformational growth
Continuous improvements delivered … … and further to come

World-class execution building on more than 20 years running large-scale CAM factories

Continuous improvements along key operational dimensions over the last 5 years, e.g.

- Energy efficiency increase
- Down-time losses reduction
- Output increase

… and further improvements to come, e.g.

Illustrative Fundamental product and process understanding

- Equipment design + Process design

Output increase
Set up for further optimization and innovation

Operational excellence
- Cost optimization and debottlenecking
- Maintenance and Capex Procurement strategy
- Digital roadmap: further improvements in efficiency, visibility and analytics

Plant design
- Larger plants leveraging scale
- Modular design of plant and equipment
- Net zero carbon greenfield plant
- Smart location selection

Continuous improvement and break-throughs of operational and cost efficiency

Process innovation

30% expected improvement in capex efficiency\(^1\) and significant optimization of operational costs between 2022-30

\(^1\) Expected capex efficiency excluding inflation impact
Modular plant design leverages footprint expansion

Modular design of firing, pre- and post-treatment steps:

- Flexibility in combining different process steps
- Higher utilization, efficiency and scalability
- Standardized concept for multiple sites
- Transferability of operational excellence initiatives
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**Rechargeable Battery Materials – RISE**

Capture profitable growth and create sustainable value

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**R**
Reliable Transformation Partner

**I**
Innovation & Technology Leader

**S**
Sustainability Champion

**E**
Excellence in execution

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<th>TECHNOLOGY &amp; IP PORTFOLIO COVERING PERFORMANCE &amp; COST</th>
<th>KEY PARTNER IN TRANSITION TO LOW CARBON MOBILITY</th>
<th>STEP-CHANGE IN PROCESS, OPERATIONAL AND ORGANIZATIONAL EXCELLENCE</th>
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Sustainable EBITDA growth with margins ~ 20% in 2030
Value accretive after 2026
materials for a better life