

CAPITAL MARKETS DAY

2 September 2015 Andaz London Liverpool Street



Energy & Surface Technologies

Marc Van Sande

Executive Vice-President, Energy & Surface Technologies

Agenda







Business group profile







Materials for energy and surface applications



Closing the loop



Rechargeable Battery Materials	Closed loop through Battery Recycling pilot ready for scaling up	Ni Mn Co Li
Cobalt & Specialty Materials	Residues from the tooling and aerospace industries and catalysts from the petrochemical industry	Re Co W Ta Cu Ni
Electroplating	Residues from electroplating baths (other BU)	Au Ag Rh Ru Pd Pt
Electro-Optic Materials	Ge bearing residues	Se Ge
Thin Film Products	In bearing residues	In Sn



Asian presence increasingly important

DAY





Growth & profitability drivers

Business unit





Rechargeable Vehicle electrification **Battery Materials** Growth in RBM **Cobalt & Specialty Materials** Plating and chemicals industries Electroplating Asian demand in electronics **Electro-Optic** Infra-red optics in consumer **Materials** electronics, new satellite programs Display industry growth, **Thin Film Products** thin film batteries

Main

growth drivers

Scale effects, product and process technologies

Supply chain integration, process excellence

Product & applied technology

Supply chain integration, product technology

Scale effects, product & process technologies



Key takeaways









Rechargeable Battery Materials

Speaker

Kurt Vandeputte

Vice-President, Rechargeable Battery Materials

Agenda







Agenda



1	2	3	4
Business profile	Market drivers and prospects	Growth opportunity	Key takeaways



A close fit with megatrends





Transportation: fuel-based towards electricity-based



Electricity generation: increasing share from non-fossil sources (wind, sun, bio, hydro,...)



Metal-based functional materials enable recyclability





A leading player in the industry



Market characteristics

- Li-ion battery technology is established reference for portables and automotive applications
- Cathode material is important to performance and cost of a Li-ion battery



A **broad spectrum of metalbased materials** used in Li-ion batteries

Umicore

offering



Umicore is a leading cathode material supplier with a large industrial footprint. We have produced enough cathode materials to:



Provide a smartphone **to every** person on the planet



Power more than 1 million EVs



Technology leadership and a proven quality track record combined with a strong application know-how are key for business success



A global presence







Umicore occupies a unique position in the value chain guaranteeing high speed to market, supply security, and responsiveness to customer needs

Unique industrialization capabilities





Two decades of market presence in cathode materials for Li-ion batteries



Process innovation fuels productivity improvements while maintaining highest quality standards (stringent automotive standards)

Established industrial footprint close to the customer



Strong industrialization capabilities building on historical Umicore key competences

Integrated process flows with guaranteed access to critical raw materials allows an agile market approach



Umicore's production plant in Cheonan





The biggest cathode material production facility in the world



Agenda







Supportive market conditions Base case





will be vehicle electrification



Exciting upside potential High case





The main growth driver will be **vehicle electrification**





Market focus: Portables



- Main Li-ion market segment today driving material technology directions
- Smart phone, tablet and notebook applications are the volume drivers in the electronics subsegment
- Electric Power Two-Wheels is a new growth driver based on similar battery and material technologies
- Market growth rates
 stabilizing towards 4-6% p.a.





Market focus: Electrified transport



Total automotive production by drivetrain pHEV / EV 3% pHEV / EV 1% Micro HEV Micro HEV / HEV / HEV **29**% **61**[%] ICE **70**% ICE 36% 2015 2020

- Market segment is very diverse (automotive, heavy duty, marine, aviation) though near-term driven by automotive
- Car market continues on growth track
- Electrification roll-out geographically and technologically diversified



Understanding Li-ion battery requirements for automotive subsegments Selecting most cost effective Li-ion battery system for a given Power to Energy requirement **Expanding** to small delivery vans, utility vehicles and e-buses



CAPITAL MARKETS DAY

Market focus: Electrified transport



- Aligning the right material technology and production capacities with the specific market demand profiles is crucial
- Energy, more specifically 'Cost of Energy' (\$/kWh), is a key driving force for material choices in Liion battery technology
- Additional user requirements determine material technology decisions (eg. fast charge capability, cold cranking,...)

Share of automotive battery in 2020 in GWh





Market focus: Energy Storage Systems



- Li-ion based storage systems serve only a niche segment
- Industrial power grid connected systems offer the main opportunity
- Increasing non-fossil electricity forces regulators to define 'minimum' connected electricity storage buffers to guarantee power grid stability
- Reliability and long-term TCO form
 the value proposition
- Technical requirements and market size do not require application specific material design optimization





Agenda







Umicore cathode material heat map



Segment	Cathode Material Options			
Portables Premium	HEI		NMC/NCA 🗸	
Portables Standard	NMC	LCO	LMO	
Automotive 'Energy'	NMC/NCA 🗸		LMO	
Automotive 'Power'	NMC/NCA 🗸	LMO	LFP 🗸	
Energy Storage System	LFP 🗸	NMC/NCA 🗸	LMO	

Umicore's portfolio focuses on sizeable segments offering significant market growth



Material specific market opportunity evolution







CAPITAL MARKETS DAY Umicore covers the main market segments with its HE LCO, NMC and LFP materials with **freedom to operate** and is **well positioned for future material trends and market growth**





Significant accessible market for Umicore Base case



Umicore is well positioned to participate strongly in the market growth



Significant accessible market for Umicore umico materials for a better 1 High case 300 Cathode material 250 demand in kT (indexed) 200 150 Market accessible for Umicore 100 LMO LFP 50 NMC LCO HE LCO 0 2015 2020 high case

Umicore's supply chain integration and industrialization competences support a transformational growth scenario



Growth strategy 2015-2020







Cost leadership through economies of scale, process development, competitive sourcing (jointly with CSM) and operational excellence



Agenda







Key takeaways





Li-ion is the technology of choice for portable and automotive segments in the coming decade



Market demand remains strong and transport electrification is the main growth driver



Umicore is **uniquely positioned** to capture this growth due to its customer proposition

- Eexcellent cathode materials technology and freedom to operate
- Production expertise and ability to scale up volumes
- Integrated supply chain

