



umicore
materials for a better life



From E-waste to Battery Recycling Pyrometallurgical Extraction

Mathias Miedreich, CEO Umicore

World Materials Forum in Nancy
July 6th, 2023

Umicore's unique and world-leading metals recovery

Serving an increasingly challenging e-waste market



Best-in-class in sustainable complex recycling

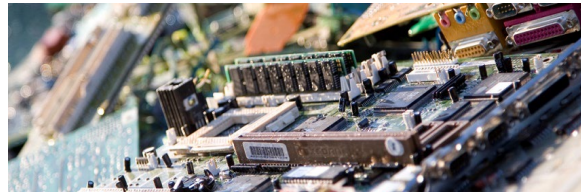


Trusted partner to our customers

Track record of nearly **25 years** in precious metals recycling

Returning **best-in-industry metal value**

Challenging e-waste recycling market



Increasing e-waste competition worldwide

Decreasing precious metals content and value

More stringent legislation

Way forward for the industry



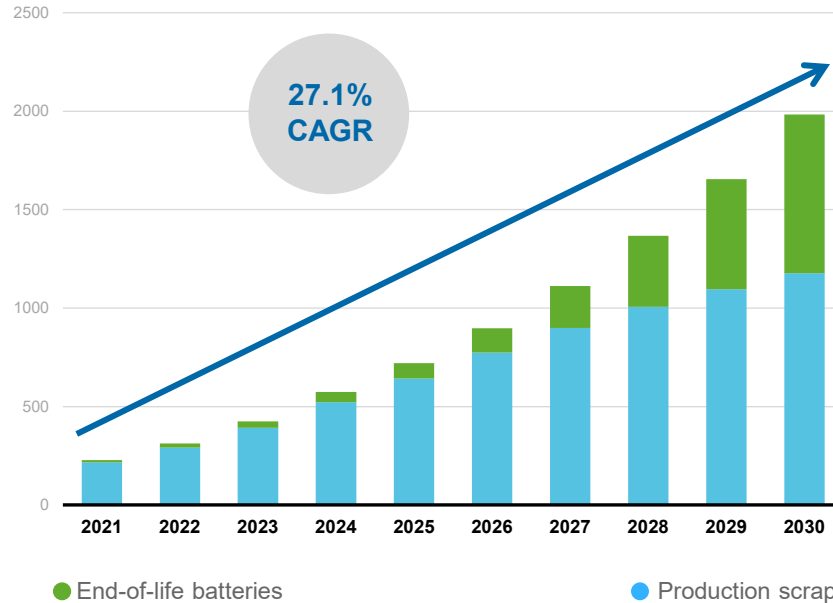
Decarbonization / CO2 efficiency

Potential to unlock additional premiums for best-in-class recyclers

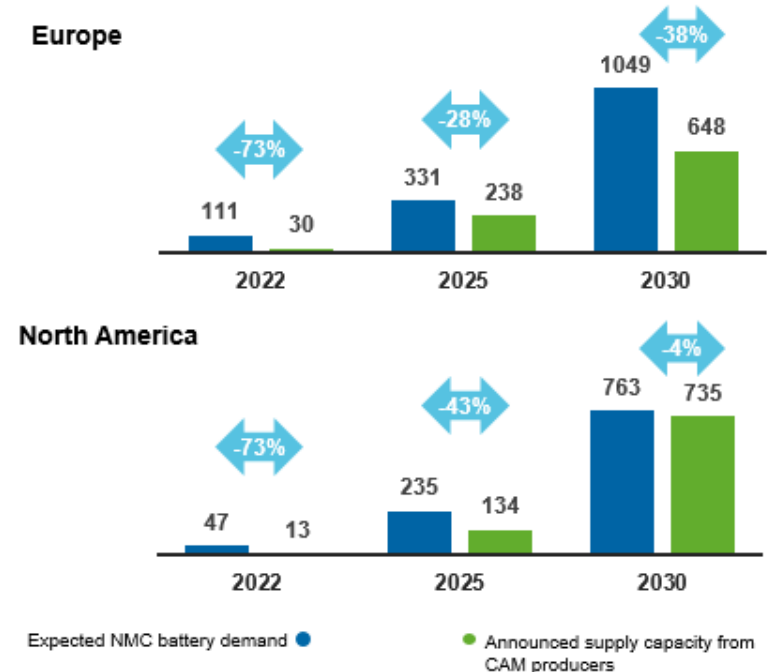
Strong acceleration of EV battery recycling is critical

Structural undersupply of cathode active materials

End-of-life EV batteries and production scrap available for recycling (kMT, global)



Addressable CAM market – supply & demand imbalance (GWh, excl. LFP)

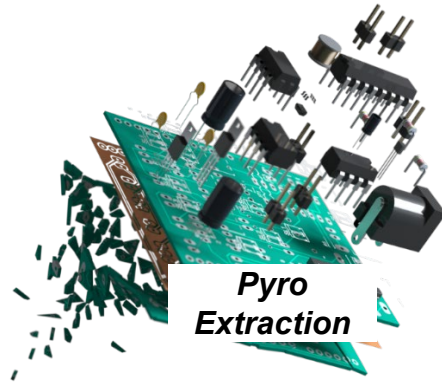


Umicore leverages unique chemistry and metallurgy

Technology transfer to batteries based on pyro-metallurgy



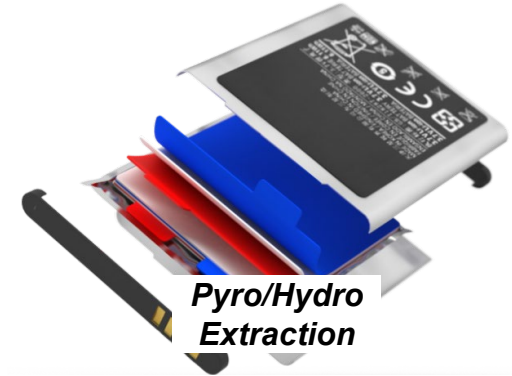
Precious Metals Refining and Recycling



Unrivaled process design focused on the sustainable recovery of **precious and valuable metals**



Rechargeable Battery Recycling



With the same focus and 125 years of expertise, Umicore operates a **unique and sustainable** battery-recycling process

Unrivaled, best-in-class, sustainable recycling process



Proprietary state-of-the-art pyro combined with lean hydro metallurgy



	 umicore Pyro-Hydro	Others Mech-Hydro
Lower investments & costs		<ul style="list-style-type: none"> • CapEx 20-30% lower • OpEx 35% lower
The most sustainable – lowest emissions		<ul style="list-style-type: none"> • Lowest GHG emissions • Pyro Scope 1 easier to decarbonize vs hydro Scope 3 • Lower CO2, water, waste footprint
Industry-leading yields at battery-grade quality		<ul style="list-style-type: none"> • Umicore yields • >95% for Ni, Co, Cu, >70% for Li • Battery-grade quality recovered metals
Maximum input flexibility & higher safety		<ul style="list-style-type: none"> • Umicore handles larger variety of complex materials • Higher operator health & safety vs mech-hydro
HIGHEST VALUE CREATION		<ul style="list-style-type: none"> • Higher value and affordability for customers vs hydro peers

Good
 Medium
 Poor

Industrial-scale 15 kt battery materials recycling in Europe

Target to build Europe's largest recycling plant



Umicore's rechargeable battery recycling facility in Hoboken, Belgium

Pioneering in EV battery recycling
in Hoboken

Next-generation battery recycling
technology and industry-leading
yields

Keeping our pioneering role
Scaling up to 150 kt / year input
volume by 2030

Umicore's Call to Action



Design for Recycling or Circular Design

- Life cycle analysis from the design phase and throughout development
- Targets on recycling rather than “recycled content”



Collection and no-leakage

- Collection targets coupled with a no-leakage policy to keep materials within the EU



CO2 efficiency

- Recycling contributes to decarbonization and so should recycling and recycling projects themselves



materials for a better life