

Mobility Transformation

Circularity for critical metals



SPEAKER

Bart Sap

Capturing the emerging
growth in fuel cells



Agenda

1.
**Mobility
transformation
driving exponential
growth in hydrogen
fuel cell catalysts**

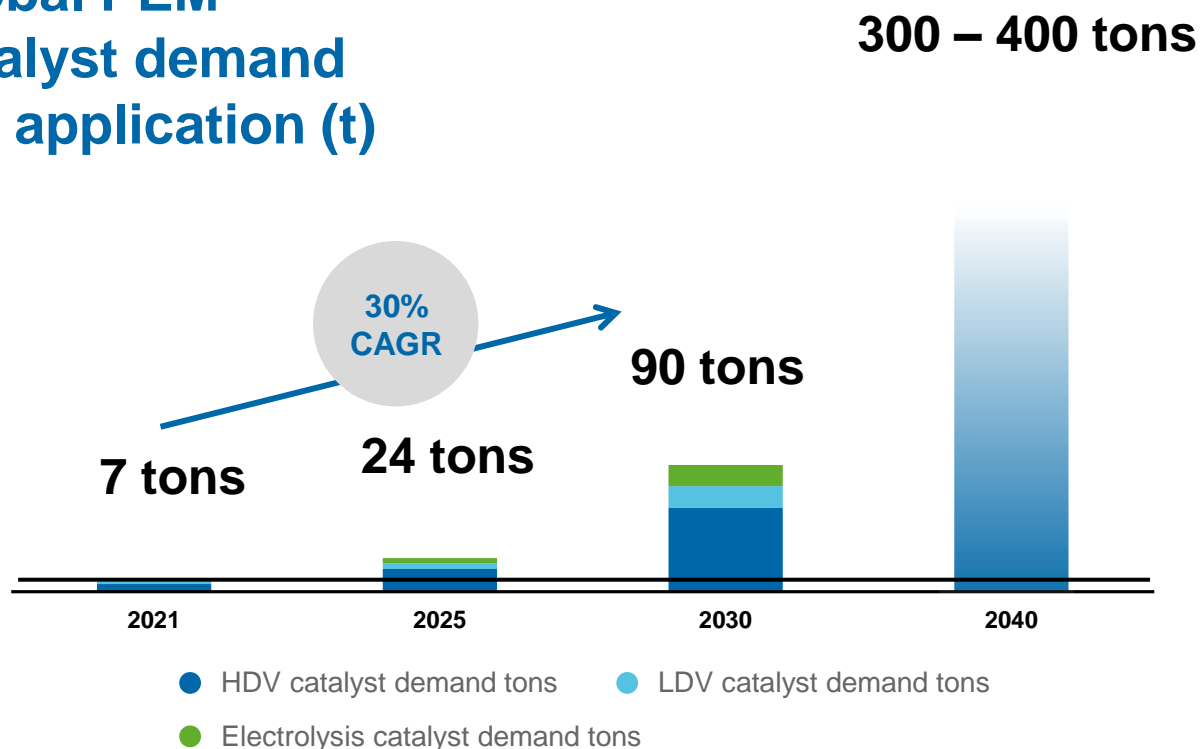
2.
**Umicore's Fuel Cell
activity well positioned
to capture emerging
growth as leading fuel
cell catalyst provider**

3.
RISE



PEM catalyst market to witness exponential growth towards 2040

Global PEM catalyst demand per application (t)



Strong regulatory support for hydrogen economy in Europe and APAC region

PEM catalyst demand to grow exponentially as of 2025 driven by increasing penetration of fuel cell HDV as well as electrolysis

➔ Global addressable market of 90t for Umicore by 2030



Source: Umicore market model (HDV incl. MDV)



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Capture emerging growth as leading fuel cell catalyst provider

Where to play

Near-term growth in fuel cell-based mobility	Adjacent opportunities
<p>Capture growth in long-haul HDV as well as long range LDV and MDV</p> <p>Further footprint expansion</p> <p>Maintain technological lead through next generation products</p>	<p>Market potential for green hydrogen electrolysis</p> <p>Well positioned based on strong expertise in automotive PEM catalysts</p> <p>Continued collaboration with best-in-class research institutes</p>

How to win



PEM: Proton-exchange membrane

Capture emerging growth as leading fuel cell catalyst provider



R

Reliable
Transformation
Partner

BUILDING CUSTOMER COOPERATIONS ACROSS THE VALUE CHAIN

Long-term OEM relationships and understanding

Global leader in PEM fuel cell catalysts with footprint at industrial scale

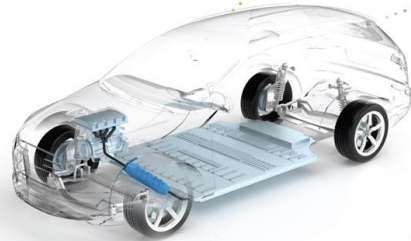


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Focus on customer intimacy to further grow customer base

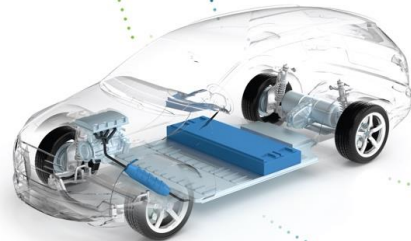
Internal Combustion Engine

Emission control catalyst



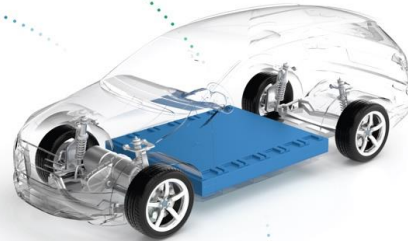
Plug-in Hybrid Electric Vehicle

Battery active materials and emission control catalysts



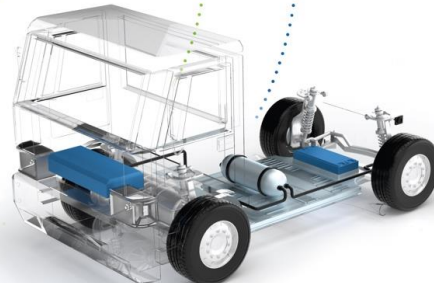
Full Electric Vehicle

Battery active materials



Fuel Cell Vehicle

Electro-catalyst and battery cathode materials



Fully committed and trusted **technology partner** for our customers throughout clean mobility transformation on all drivetrains



R

30 years of experience in fuel cell catalysts, serving the full value chain



1990
First developments of Platinum Black as Fuel Cell Catalysts

2003
Catalysts for PEM Electrolyzers

2006
Creation of SolviCore JV with Solvay on MEA

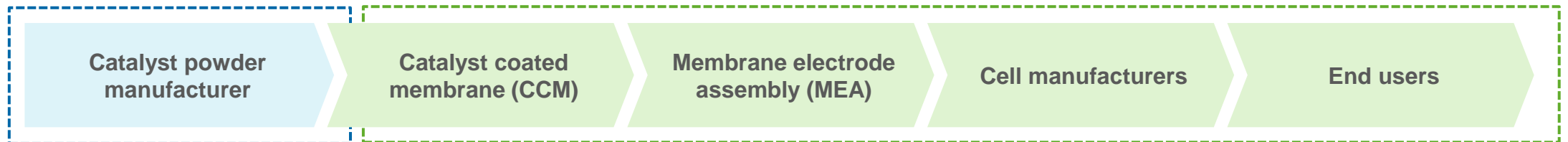
2009
Creation of Co-development with HMC on catalyst

2015
Focus on PEM fuel cell catalysts: sale of SolviCore JV

2018
Development of High Performance Anode Protection Catalysts

2019
First mass production catalyst plant in Korea

2024
Mass production catalyst plant in China



Clear focus on PEM catalysts

Umicore targeting all supply chain players



HMC: Hyundai Motor Company;
PEM: Proton-exchange membrane

R

Working with customers at the forefront of fuel cell technology



~ 10,000 HMC vehicles with Umicore catalysts
2021

Joint Development Contract with HMC
2009

949 HMC vehicles with Umicore catalysts
2018

HMC one of the first hydrogen fuel cell vehicle OEMs

2018 launch of NEXO, the only fuel cell SUV in the world, with 135kW powertrain and range of 665km

→ Key HMC development partner and supplier for PEM fuel cell catalysts since 2009, providing durable high-performance catalysts



HMC: Hyundai Motor Company



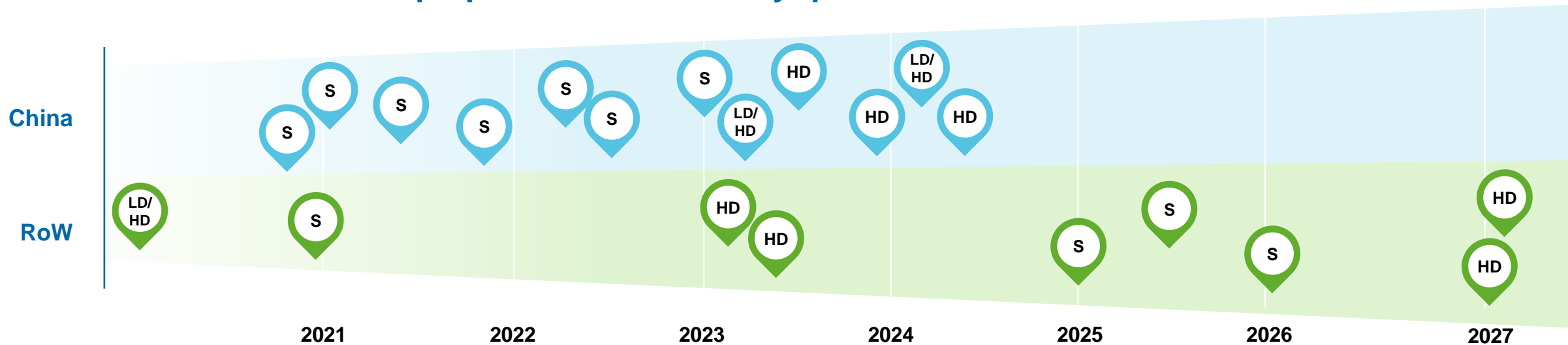
Leading supplier of fuel cell catalysts



40% market share in the mobility segment in 2021

Qualified supplier of more than 10 OEMs
(LD and HD OEMs as well as stack producers and system manufacturers)

Ramp-up timeline for already qualified business awards ...



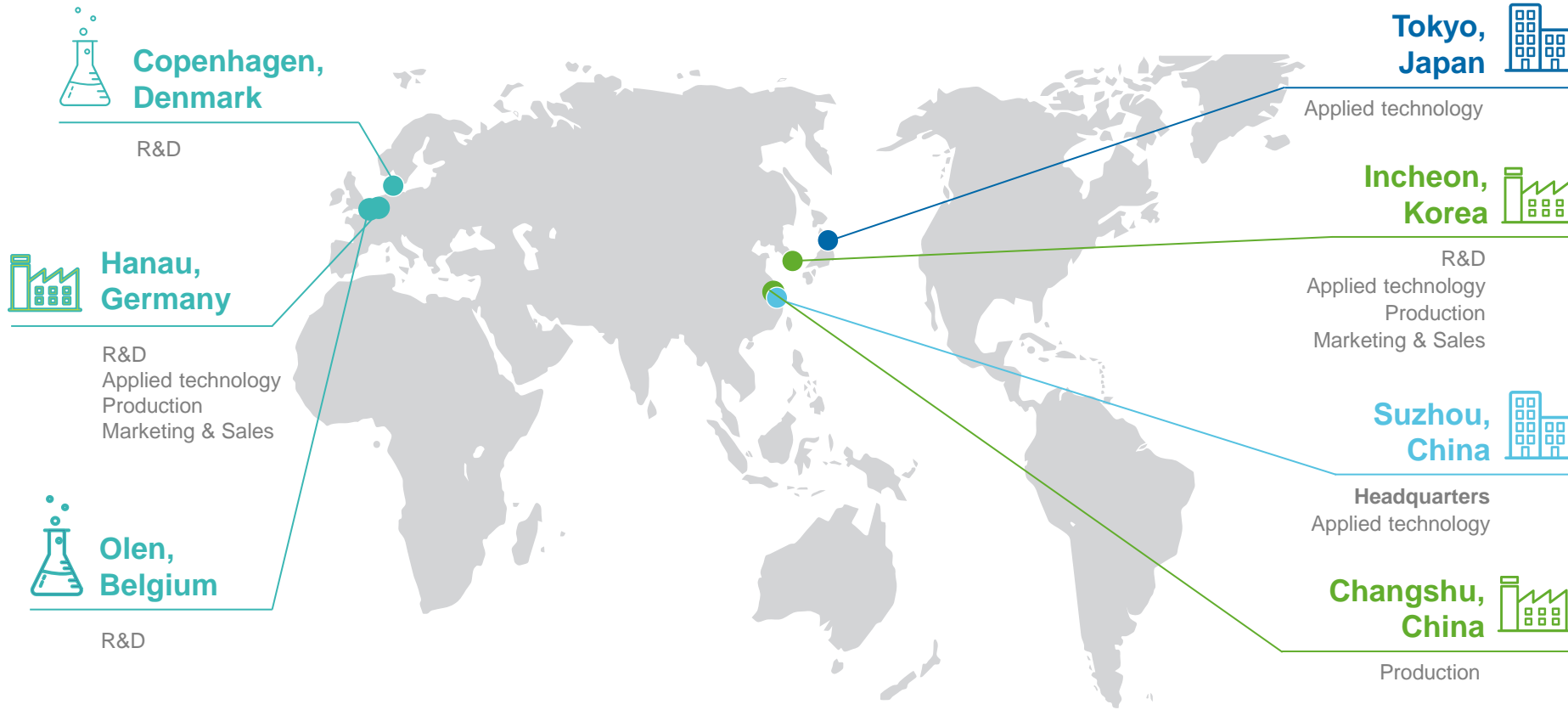
... and ongoing engagements for new platforms globally



Ramp-up = start of serial production on platforms
(LD = light-duty, HD = medium- and heavy-duty, S = stack/MEA producers)



Expanding global footprint to serve growing customer demand



→ **Mass production plant commissioned in Korea in 2019**

→ **New greenfield expansion in China to serve growing global customer demand**



 **Supported by Catalysis' in-depth know-how in PGM sourcing**

 **Capability to close the loop through PGM recycling**

Capture emerging growth as leading fuel cell catalyst provider



Innovation
& Technology
Leader

MARKET-LEADING TECHNOLOGY

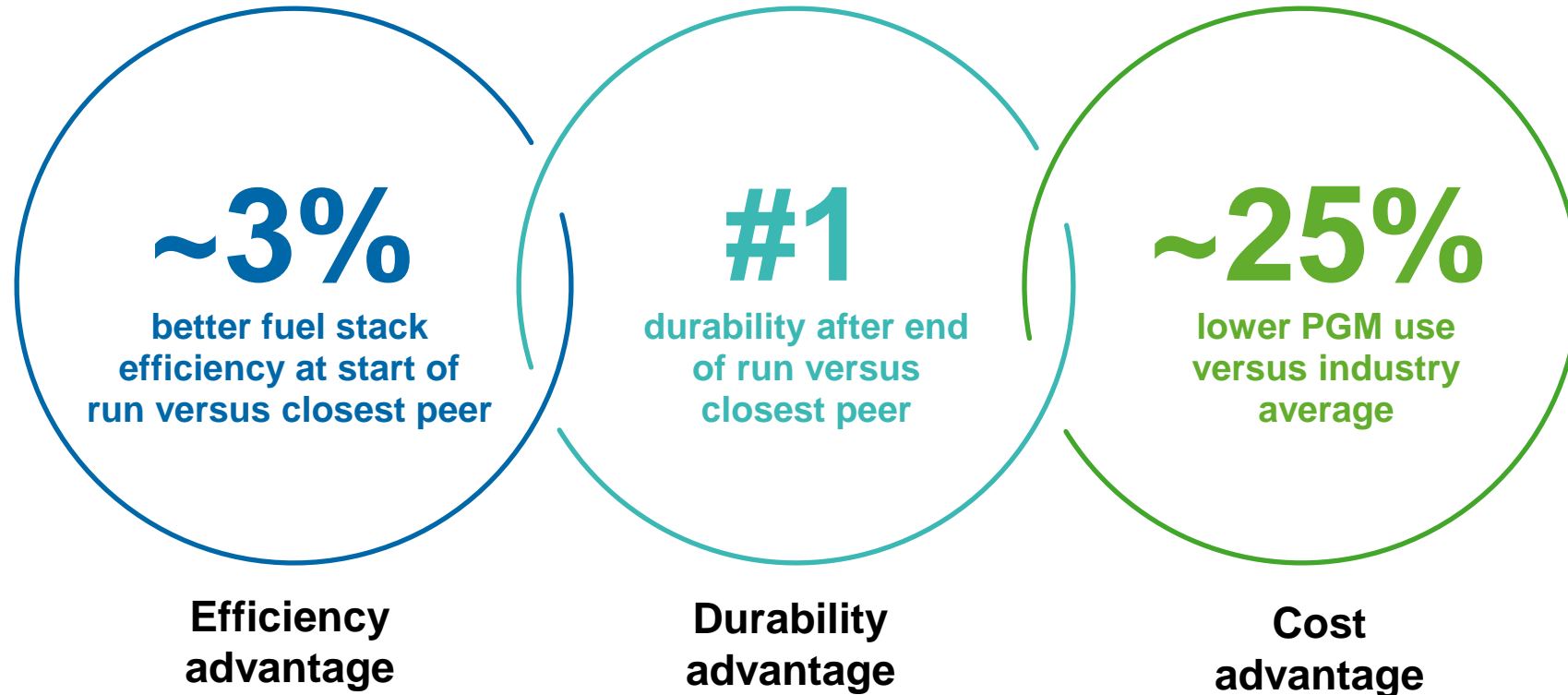
Industry-leading materials in terms of durability, performance and PGM loading

Research and innovation at the heart of the fuel cell growth strategy





Benchmark PEM catalysts for Heavy-Duty



Umicore's PEM catalyst technology enables increased range and lower TCO which are the key sourcing criteria for OEMs



PEM: Proton-exchange membrane
Source: Customer benchmarks



Benchmark PEM catalysts

Roadmap to reduce PGM loading and make fuel cell applications more cost competitive



Research and innovation at the heart of Umicore's fuel cell strategy

> 250
Fuel cell patents
filed over the world

6
R&D and applied
technology centers

Open innovation with best-in-class academia and research institutes



PEM: Proton-exchange membrane

Capture emerging growth as leading fuel cell catalyst provider



S

**Sustainability
Champion**

KEY PARTNER FOR THE TRANSITION TO ZERO-EMISSIONS MOBILITY

Embedded sustainability value

**Delivering high performance solutions
for zero emissions transport**

S

Embedded sustainability value

Through sustainable operations & closed loop services



Managing climate and environmental impacts

Low-carbon footprint activity

Focused energy saving, on-site generation and renewable energy purchase

Ecodesign at the heart of new sites

Leveraging the closed-loop

Sustainable sourcing, recycling PGMs and feeding our input mix with recycled content

Addressing resource scarcity

Already ~25% lower PGM use vs industry average





Delivering high-performance solutions For zero emissions transport



**Umicore PEM catalysts already
prevented 147,000 tons of GHG emissions
from being emitted into the air in 2021**



PEM: Proton-exchange membrane
Using average personal vehicle lifetime of 200 000 km

Capture emerging growth as leading fuel cell catalyst provider



E

Excellence
in execution

SCALABLE VOLUME PRODUCTION

**Scaling-up production footprint
in most cost-efficient way**



E

Scaling-up of production footprint in most cost-efficient way

Umicore's PEM
catalyst production
plant in China, the
biggest PEM catalyst
production facility
in the world



Proven mass production
processes with scalable low
cost base

Investment in new Chinese
production plant driven by
growing customer demand

Modular investment approach
for stepwise capacity expansion



PEM: Proton-exchange membrane

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Fuel Cells – RISE

Capture emerging growth as leading fuel cell catalyst provider



Head start, based on proven technology leadership
Profitable today and value accretive throughout period



umicore[®]

materials for a better life