

# CAPITAL MARKETS DAY

2 September 2015

Andaz London Liverpool Street



# Technology & Innovation

Speaker

*Denis Goffaux*

*Executive Vice-President / Chief Technology Officer*

# Agenda

1

Overview  
of Umicore  
R&D effort

2

R&D support for  
Horizon 2020

3

Post Horizon  
2020  
projects

# 17 R&D and Technical centres



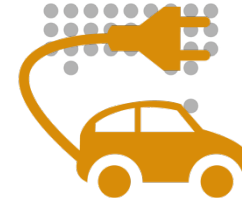
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Catalysis



Recycling



Energy & Surface Technologies



# Umicore R&D Highlights



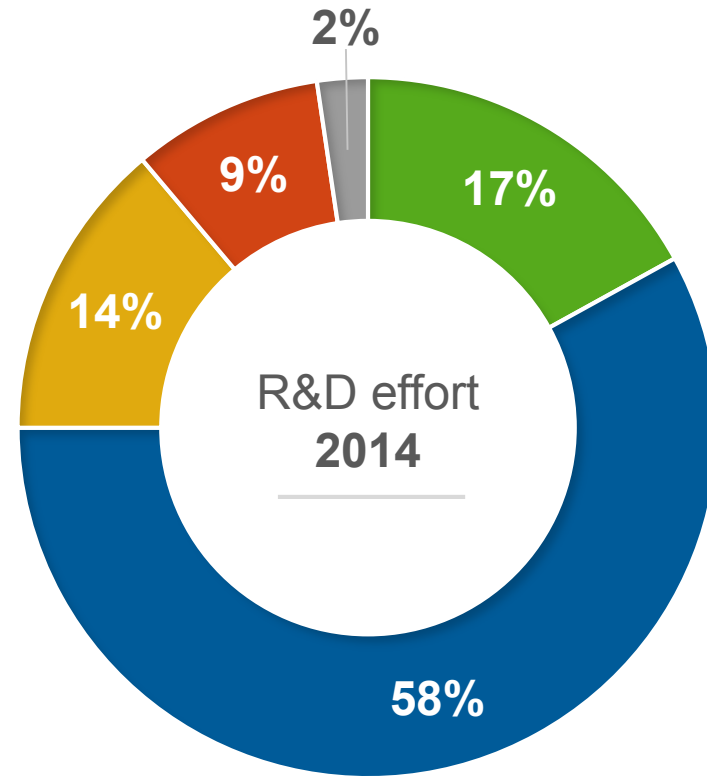
Total consolidated net expenditures of **€143m**



**6% of revenues** invested in R&D



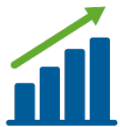
**539 patent families**,  
43 patents filed in 2014



- Recycling
- Catalysis
- Energy & Surface Technologies
- Corporate
- BP and ZC (Discontinued)

# Umicore R&D

Focus on clean mobility and recycling



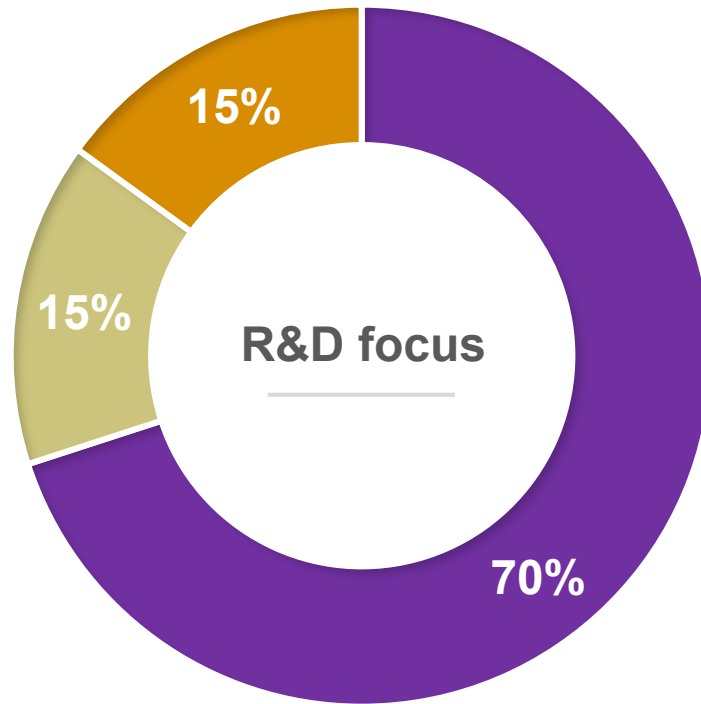
Resources channeled primarily to **key growth engines of clean mobility and recycling**



Group R&D has a strong **focus on process technology**



Business units focus more on **product technology and system integration**

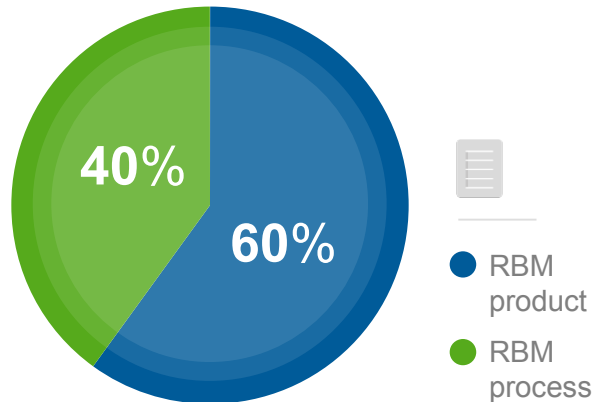


● Combined Horizon 2020 clean mobility and recycling

● Horizon 2020 other  
● Post Horizon 2020 and other

# Horizon 2020 R&D

## Clean mobility

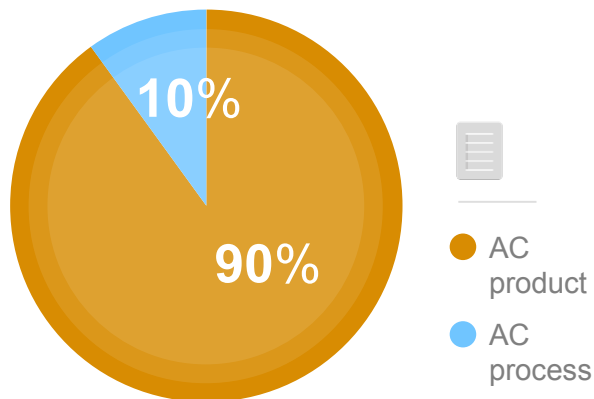


### Rechargeable Battery Materials

Technologies for massive production scale-up

Next-generation cathode materials

Maintaining competitive edge in high-energy materials



### Automotive Catalysts

Functional washcoat ingredients

Layered design and nano-clustering

System integration

# Horizon 2020 R&D

## Recycling



Supporting the current **40% expansion in Hoboken** (smelter, blast furnace etc.)



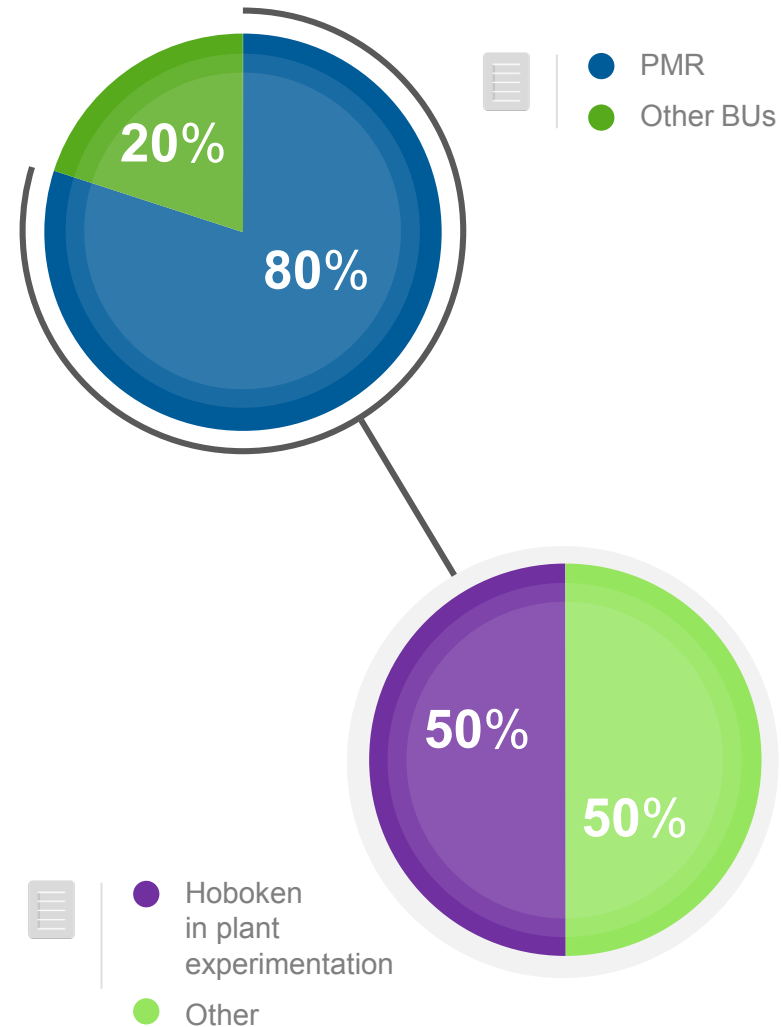
Further increase technology lead



**50% of R&D** is done as in-plant experimentation and testing

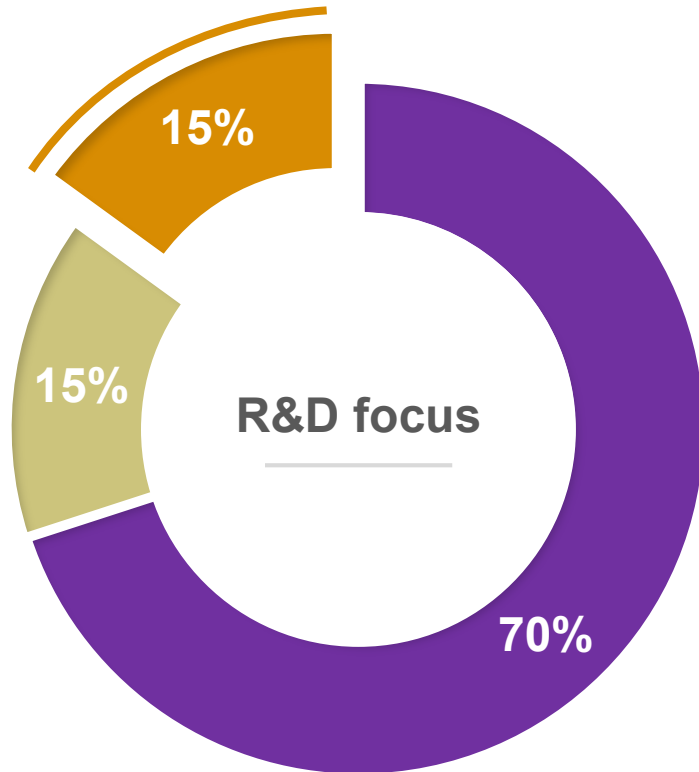


Group R&D in Olen conducts much of the ideation and proof-of-concept research at lab and pilot scale





# R&D beyond Horizon 2020



## 3 key projects

UHT  
technology



Fuel cell  
catalysts



Anode  
materials



● Combined  
Horizon 2020  
clean mobility  
and recycling

● Horizon 2020 other  
● Post Horizon 2020  
and other



Recycling

# UHT technology

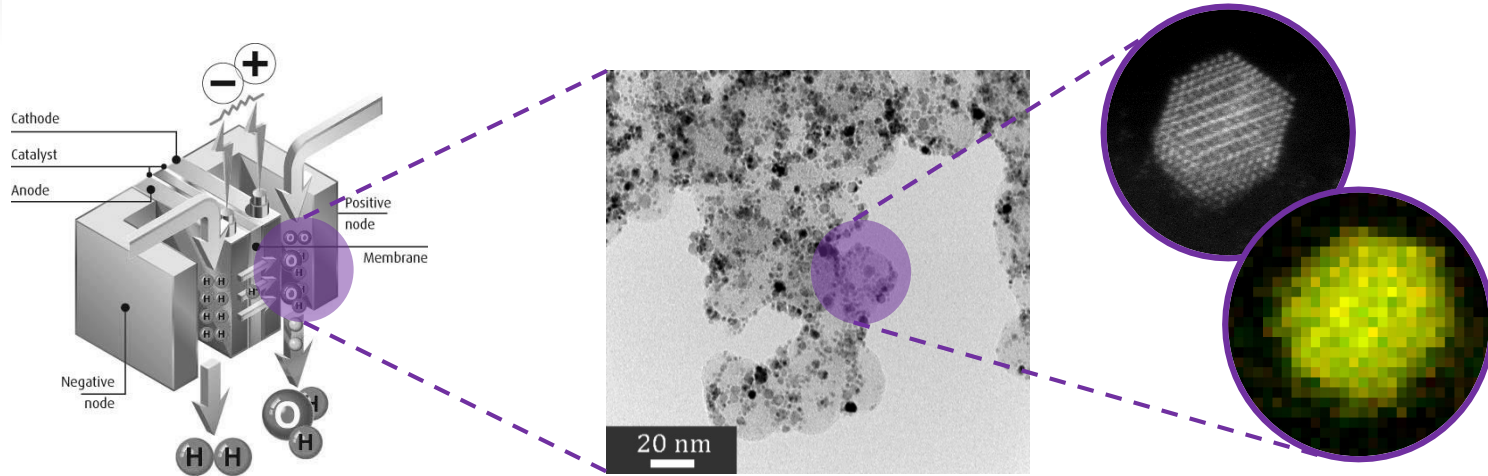


## Preparing the long term by technology development (UHT furnace) leading to new growth options post 2020

- Preparations for the **battery recycling market** growth that is anticipated post 2020
- Project work being stepped up with ongoing **industrial testing** work
- Further valorization of residues and additional metal recovery



# Fuel cell catalyst development

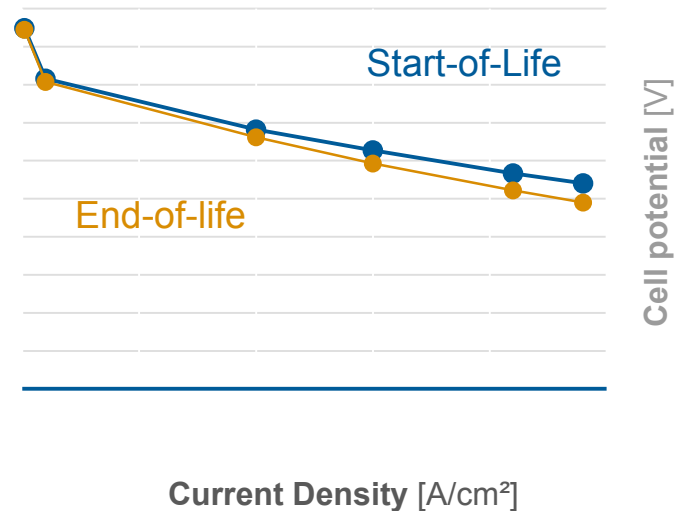
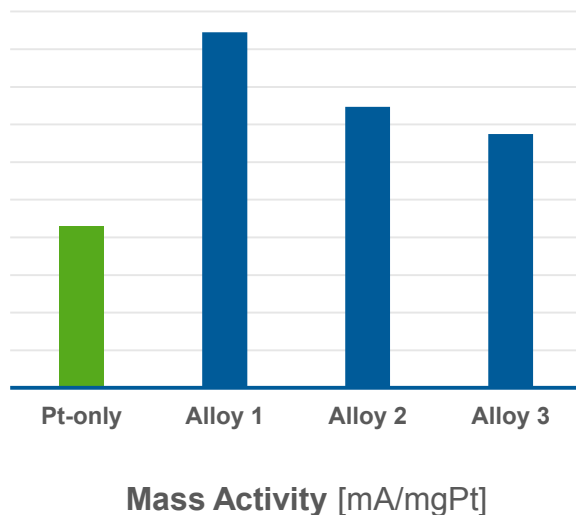


Developing highly active materials for anode and cathode

Platinum saving and improved durability by specific design of nano-alloy clusters



# Breakthrough performance



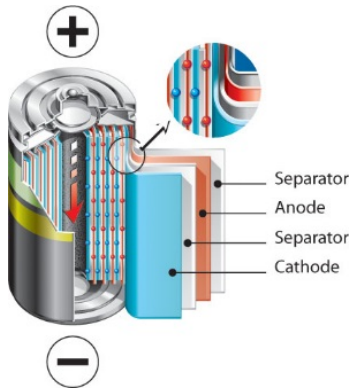
Group R&D competences in **rational catalyst design, modeling** and **precious metal processing** allowed Umicore products to achieve:

**2-fold activity**  
of alloys versus Pt-only

**Stable performance**  
over lifetime



# High capacity anode materials for Li-ion batteries

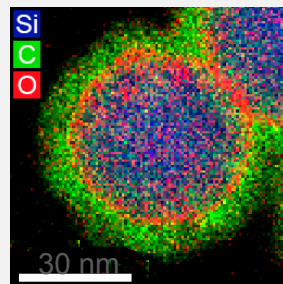


**New high capacity anodes** are mandatory to achieve the energy targets of portable and automotive applications

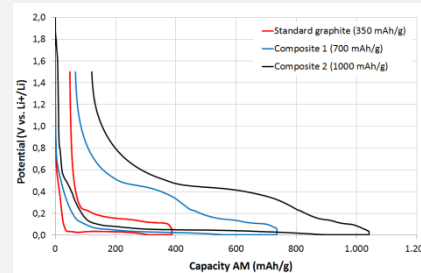
**Silicon technology** is the preferred solution but faces technological challenges

Umicore's core competences enable development of **functionalized silicon compounds** for high-capacity advanced anodes

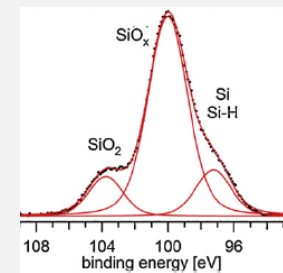
*Functionalized silicon*



*Anode capacity*



*Silicon surface*



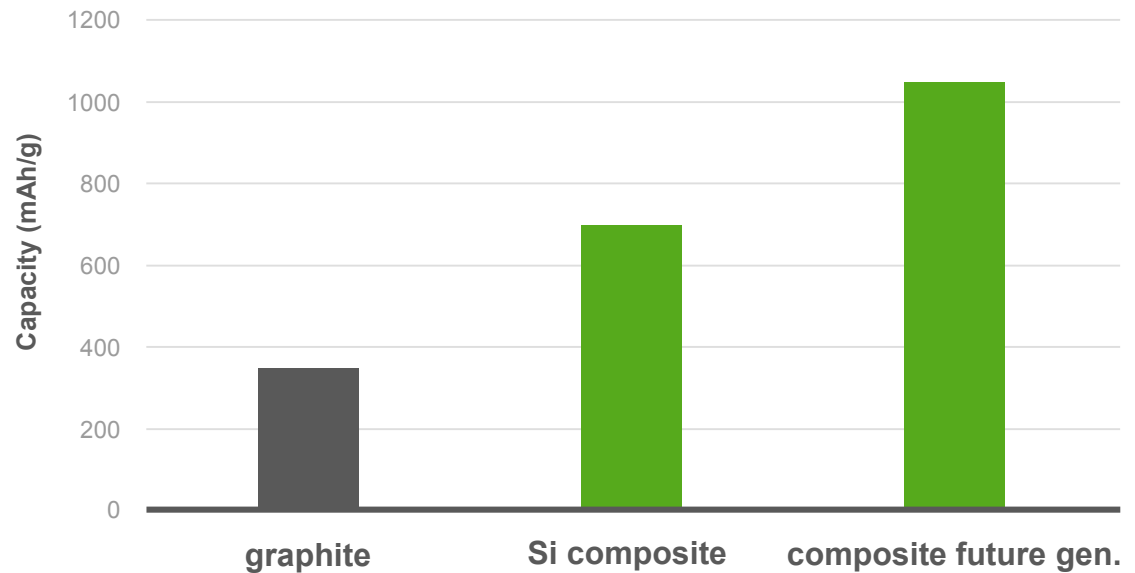


# Step change improvement in performance

Energy &  
Surface  
Technologies

Silicon technology  
has **2-10 times higher capacity** than current  
graphite technology

Energy density of  
batteries will potentially  
be **increased by 50%  
or more** compared to  
current state-of-the-art  
technology



# Key takeaways



Consistent  
high level of  
investment  
in R&D



Strong focus  
on major growth  
drivers for  
Horizon 2020



Post 2020 focus  
remains on clean  
mobility and  
recycling