

# PGM RECYCLING FOR THE H2 ECONOMY – SPOTLIGHT ON IONOMER RECOVERY

Dr. Jan-Patrick Melchior, Materials Valley - Beyond Elements 06.11.2024

Heraeus

Platinum  
999,5



500g



## IN A NUTSHELL



**One of the top 10 family owned  
companies in Germany**

30 bn € Sales | 17,000 Employees



**Heraeus Precious Metals**

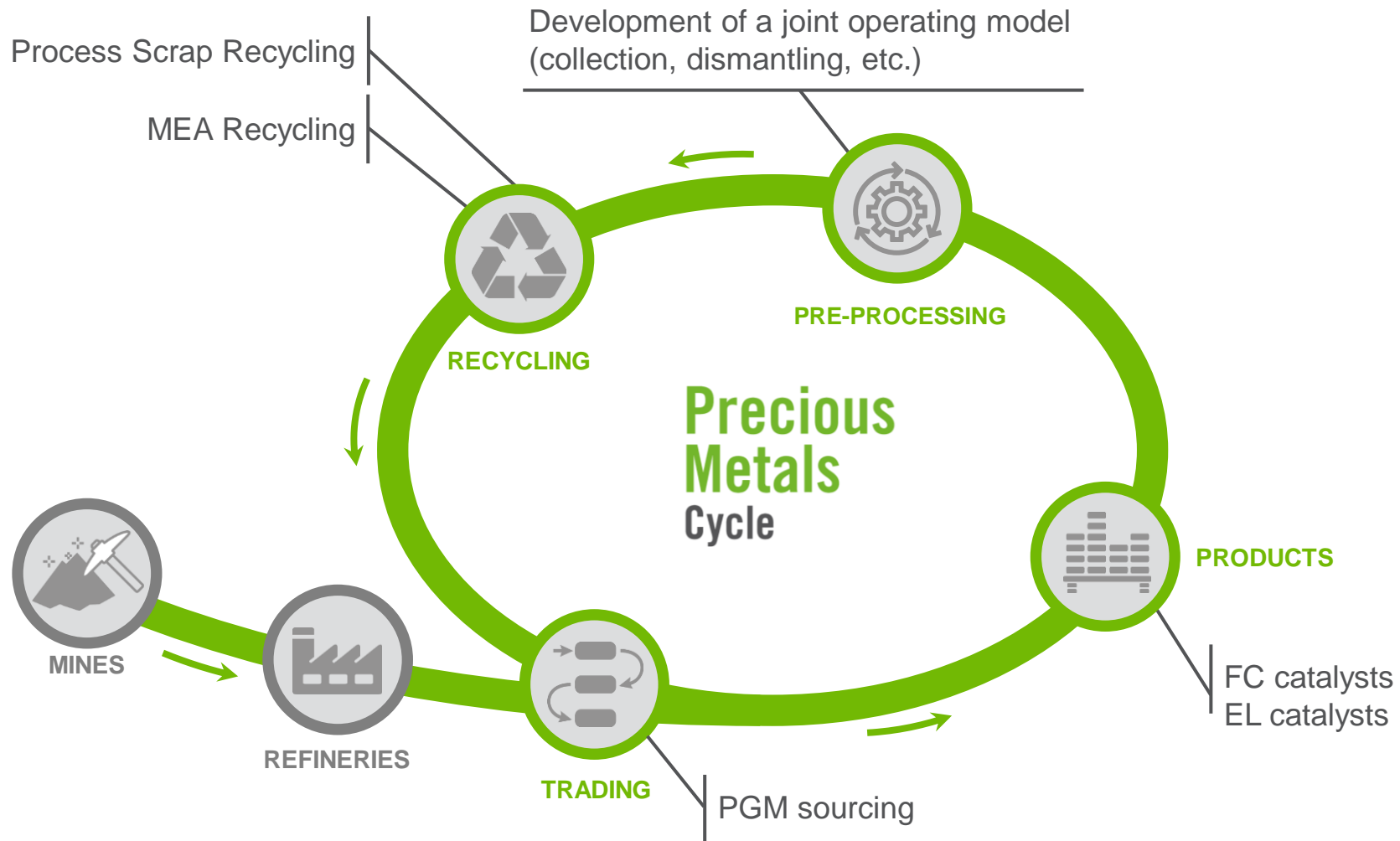
Heritage and strong, global  
player in our portfolio



**Precious Metals are in our DNA**

Trading, Products, Recycling

## PRECIOUS METAL SOURCING AND RECYCLING LOOP



# PGM RECYCLING FROM CCMs

Incineration and wet chemical treatment of CCMs and production waste is standard right now



**Standard recycling of CCMs** is based on incineration, followed by wet chemical treatment

**Strong advantage of incineration step:**  
Homogenization of the ash and assaying

**Carbon Footprint** depends on energy source for furnace. New electrified furnace unit allows for ca. 25% CO<sub>2</sub>e reduction

CO <sub>2</sub> e / kg CCM	
Incineration (Natural Gas)	6.7 kg
New electrified furnace unit	5 kg

**Critical:**

- **Destruction of fluoropolymer** membrane material (ionomer) during incineration
- **Furnace design and suitable exhaust gas treatment**

# PGM AND IONOMER RECYCLING

Sustainable if recycled ionomer can be reused, repaired or repurposed



Processes for non-destructive, wet chemical CCM recycling with similar PGM recovery rates are under preparation (Pt > 98%, Ir > 90%)

Carbon Footprint of ionomer recycling

CO <sub>2</sub> e per kg CCM	
Alcohol-based treatment w/o ionomer beneficiation	23 kg
Alcohol-based treatment w/ ionomer beneficiation	- 680 kg

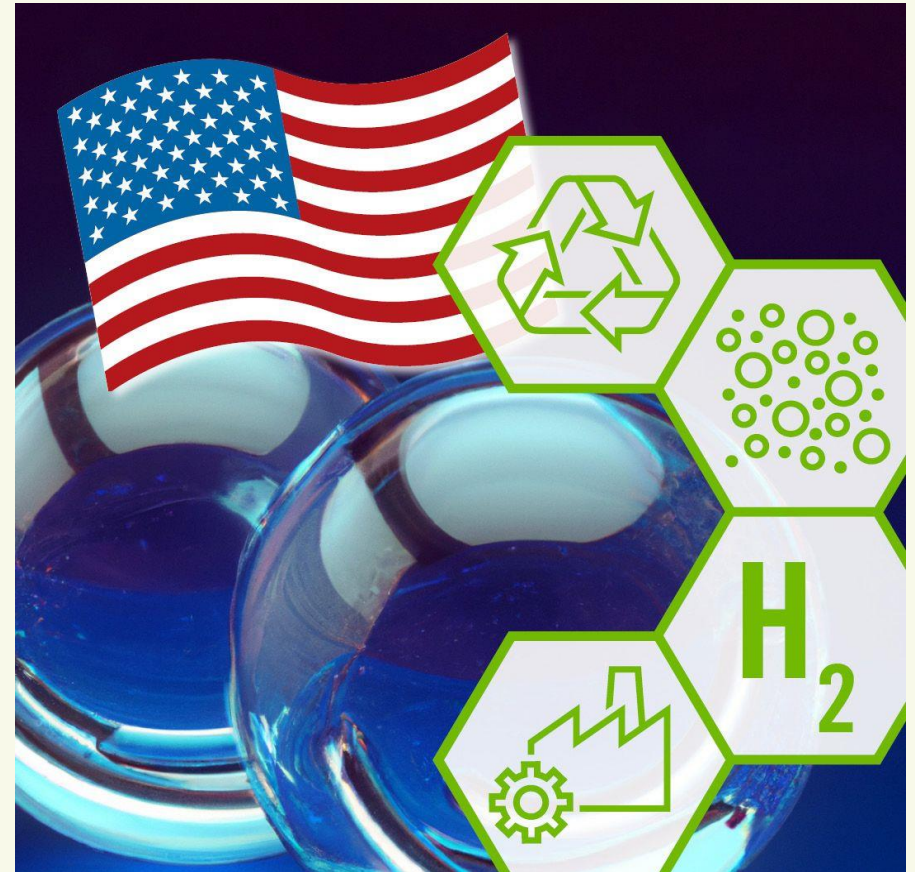
Challenges:

- Potential use case for recycled ionomers
- Qualification of recovered ionomer for different use cases
- Availability of EoL stacks (in particular PEM EL) for process finetuning and scaling
- Taking representative samples without incineration

## COOPERATION IN H2CIRC

### Recovery, recycling and reuse of clean-hydrogen materials and components

- Heraeus Precious Metals is part of the **consortium H2CIRC**
- Led by **AIChE – American Institute of Chemical Engineers**
- Develop innovative and practical approaches to enable the **recovery, recycling, and reuse of clean-hydrogen material and components**
- **50 million US Dollar** out of a total of 750 million for the recycling part



## DISCLAIMER

This presentation has been created using information obtained from sources that Heraeus believes to be reliable. As Heraeus is not able to verify every information obtained from such sources, Heraeus does not warrant the accuracy and completeness of such information that is contained in this presentation.

Heraeus assumes no liability for any losses or damages of whatsoever kind, resulting from whatever cause, through the use of or reliance on any information contained in this document. However, in so far as a liability claim exists under German law, Heraeus shall have unlimited liability for willful or grossly negligent breach of duty. Unless expressly permitted by law, neither this document nor any part of it may be redistributed or reproduced in any manner without written permission of Heraeus. Heraeus accepts no liability whatsoever for the actions of third parties in reliance on this document.

The analysis and opinions set out in this presentation include forward-looking statements, which are based on the plans, assumptions, targets and projections as of the date of the document and which are subject to inherent risks, uncertainties and other factors which could cause actual results to differ materially from the projected results. Heraeus does not undertake to update any of the forward-looking statements to reflect developments which differ from those anticipated.