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Recycling hydrogen fuel cells and electrolysers

Johnson Matthey
Inspiring science, enhancing life

Recycling hydrogen fuel cells and electrolysers

Johnson Matthey is a leader in PGM recycling. We work with our customers to optimise precious metal recovery from complex materials.

Using our recycling expertise, we're applying our longstanding knowledge to emerging PGM technologies. This includes the catalyst coated membranes (CCMs) used in fuel cell and proton exchange membrane (PEM) electrolyser stacks that will enable the hydrogen economy. We have an established route to recycle these materials, where we process the entire stack to maximise the PGM recovery and return to customers. More recently, we've developed our new **HyRefine™** technology to recycle both the PGMs and valuable ionomer.

Establishing circularity for fuel cells and electrolysers

With exceptional refining capabilities, we can recover the precious metals from the entire life cycle of the fuel cells - from production to destruction. Using our complex processes, we extract the PGMs from membrane electrode assemblies (MEAs) and fuel cell stacks, then refine them to a very high purity.

We use complex sampling processes and analytical methods during the evaluation stage, processing the entire stack to generate a homogeneous sample for full analysis. Then using accurate assaying techniques – ones that are proven and trusted - we're able to yield a true representation of the entire material and determine the exact amount of PGM content you have.

Once refined, metal will be returned to begin its lifecycle again. Our optimised process allows us to recover PGMs quickly, efficiently, and securely. From initial material analysis to comprehensive metal management services, we guide and advise you at each step of the process.

HyRefine™ technology for recycling catalyst coated membrane (CCMs)

As the hydrogen economy takes off, embedding circularity is critical to conserve precious resources and minimise the environmental impact of manufacturing fuel cells and electrolysers. While we have an established route to recycle the platinum group metals (PGMs) from these materials, often the ionomer isn't recovered. Through our new **HyRefine** technology we've successfully demonstrated circularity for the PGMs and the valuable ionomer together.

Our researchers have proven at lab scale that both the PGMs and the ionomer can be recovered and recycled into a new CCMs. Separate experiments have confirmed that the recycled PGM catalysts match the performance of fresh material.

Processing only fuel cell and electrolyser material, our bespoke **HyRefine** technology provides additional traceability of the critical PGMs. The metal output from this process will be 100% secondary (recycled), which has a lower carbon footprint than primary (mined) metal, offering significant sustainability benefits. This recycled PGM can then be seamlessly integrated into PGM catalyst production and subsequent CCM manufacturing.

Use the QR for more information on Johnson Matthey's new **HyRefine** technology

Compared to conventional PGM recycling routes, our HyRefine technology has up to an:

80%
lower carbon footprint

The purely chemical process offers significant sustainability benefits, including approximately:

80%
less energy used

84%
less waste produced

68%
less water used

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