A drug developer's guide to enhancing catalytic processes

Across the pharmaceutical industry, there is a growing demand for greener, and more sustainable approaches to research, development and manufacturing. While making drugs is neither easy nor cheap, catalysis can help to ensure pharmaceutical processes are more efficient.

The global catalyst market size was estimated at **US$33.5 billion** in 2019, and will witness robust growth in the next years.[1]

1 Catalysis in modern pharmaceutical processes

From powerful cross-coupling reactions to asymmetric hydrogenations, precious group metal (PGM) catalysts have become a vital tool for developing innovative routes towards today's pharmaceutical targets.

The importance of catalysis has been recognised by recent Nobel Prizes in Chemistry

2001
Knowles, Noyori, and Sharpless' work for asymmetric catalysis

2005
Schrock, Grubbs, and Chauvin's work on alkene metathesis

2010
Suzuki, Heck, and Negishi's work on the development of cross-coupling chemistry

2 Barriers to Implementing Catalysis

Despite the clear benefits for catalytic technologies, there are barriers that have limited its adoption in the pharmaceutical industry.

Barrier 3
Cost challenges
With the prices of PGMs and other precious metals constantly fluctuating as they are traded in the public market this can spark supply chain concerns.

Barrier 2
Metal removal and elemental impurities
This challenge can be addressed by limiting the catalyst loading as much as possible, and reducing the concentration of elemental impurities in the crude product.

Barrier 1
Technical challenges
Implementing new technology always provides a technical challenge, which process chemistry groups must weigh against the potential reward. This is a case-by-case consideration that must be driven by the demands of the project.

3 The Road to Catalyst Recovery

To ensure financial security, many in the pharmaceutical industry are looking at how to cut costs. For drug developers who aim to start down the road of catalyst recovery, choosing the right refining partner is essential, and can be split into three key considerations - sampling, assaying, and support.

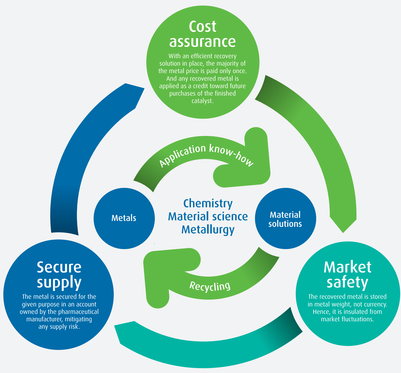
1 Sampling
The traditional approach to sampling begins with an incineration step to homogenise the material. However, this can lead to erroneous results as some metal content can be lost during the incineration process and will not be the same as in the original material.

2 Assaying
When sampling is completed, samples are assayed using a wide variety of analytical instruments and techniques. Sensitive and repeatable assaying procedures allow refiners to accurately measure the precious metals content of materials being reclaimed.

3 Support
Umicore's chemists and engineers are available to consult and collaborate with pharmaceutical process chemists and engineers in order to optimise the post-reaction steps that are taken with metal-containing streams.

4 The Closed-loop Approach

Based on this information it is in your best interest to seek a precious metals refiner that can provide the expertise needed from process design through to development, manufacturing and recovery. For this, Umicore specialises in a sustainable approach to building a closed-loop catalyst life cycle to maximise the value of precious metal catalysts in pharmaceutical synthesis.



Successful implementation of a recovery solution hinges upon a collaborative approach that starts well before commercial launch. At Umicore, our experts work hand-in-hand to provide our clients with a closed-loop approach that starts from identifying the optimal catalyst for a given transformation and designing the process with precious metal recovery in mind, leading to efficient commercial processes with the maximal return rate.

Let's co-create to make a difference | **pmc.umicore.com**

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References
[1] Grand View Research Catalyst Market Size & Share (2019). https://www.grandviewresearch.com/industry-analysis/catalyst-market