

KATALCO 74-1 GREEN: Green ammonia synthesis with reduced energy consumption and operating costs

The exponential growth of the ammonia market

Ammonia is a vitally important chemical, heavily used in the fertilizer market. With a growing global population and the increasing need for food, demand for ammonia is set to grow. In addition, there are many discussions centred around using hydrogen as a replacement fuel. This process requires ammonia as a vector, again heightening the interest in ammonia as a zero-carbon energy carrier.

Against this backdrop, the fight against greenhouse gas emissions is gathering pace. The synthesis of ammonia is an energy intensive process, consuming 2% of global energy production and generating around 3% of global carbon dioxide emissions. The urgency to develop decarbonised ammonia, at low-pressure and low temperatures has never been greater.

Johnson Matthey recognises these challenges and with a clear vision for a cleaner, healthier world, our scientists have developed solutions helping to achieve decarbonised (green) ammonia.

Novel green ammonia synthesis processes driven exclusively by renewable energy often consider ammonia synthesis at low pressure sometimes using high activity ruthenium-based catalysts which are both sensitive and expensive.

However, recent studies by Professor Laura Torrente's group at the University of Cambridge¹, have shown that KATALCO 74-1 series as an iron-based catalyst with a cobalt promoter, can

operate in regimes that could apply in such novel green processes where pressures and temperature may be lower than in conventional processes.

In addition, the structure of KATALCO 74-1, is more resistant than ruthenium to adverse impacts from trace impurities such as oxygenates.

Key benefits

- Iron catalysts promoted with cobalt are more robust than ruthenium
- Iron substantially cheaper than ruthenium, dramatically reducing OPEX costs
- Reduced energy requirements, resulting in less CO₂ emissions
- Operating at lower temperatures enables a safer operating environment

At current prices the cost of ruthenium is over 100,000 times the cost of iron ore. Viability of **KATALCO 74-1 GREEN** for deployment in novel green ammonia synthesis can therefore significantly decrease costs.

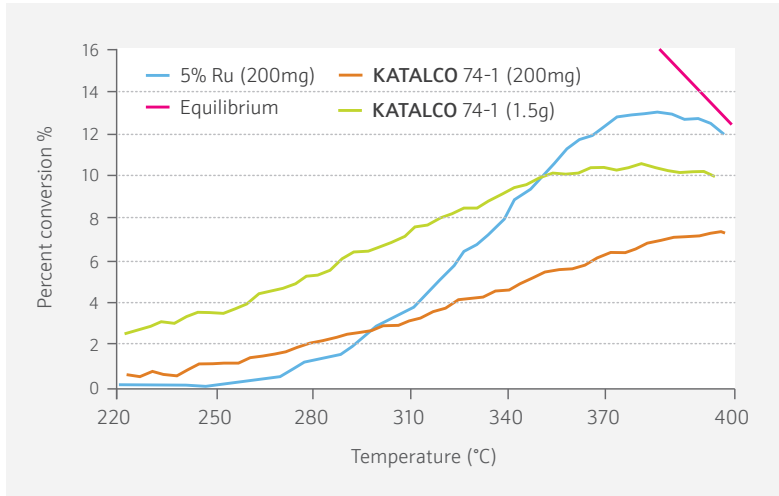


Chart showing the relative activity of each catalyst as a function of temperature and catalyst mass.

Kindly reproduced and simplified from data obtained from the University of Cambridge studies¹.

At Johnson Matthey we have two solutions depending on where you are in your sustainability strategy:

1

In conventional ammonia plants, choose **KATALCO 74-1** for maximum performance. We have many customers using **KATALCO 74-1**, including some of the world's largest ammonia plants operating within the highest efficiencies at production rates of over 3,500MTPD.

2

New plants using green hydrogen for zero carbon ammonia should choose **KATALCO 74-1 GREEN**. As this operates at lower temperatures, less energy is required.



Talk to JM today to find out how we can help shape your plant decarbonisation strategy with our exceptional knowledge of catalysts technology

To see the article in Johnson Matthey Technology Review, please scan the QR code.

¹ Smith, C., & Torrente-Murciano, L. (2022). "Low temperature and pressure single-vessel integrated ammonia synthesis and separation using commercial KATALCO catalysts". Johnson Matthey Technology Review

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