NewsLetter

OCTOBER 2023
ISSUE 4

The Drochaid team celebrates a fantastic year with members of the board at our company annual dinner

Dr Cathy Dwyer, MD
talks at the a meeting to commemorate
Professor David Jackson
Held at the University of Glasgow

Drochaid Research Services Case Study in:
A biological solution for carbon capture

Dr Hendrik van Rensburg
attends
EuropaCAT '23 in Prague

Drochaid Research Case Study
in Higher Alcohol Synthesis (HAS)

Dr Cathy Dwyer MD talks at meeting to commemorate Professor David Jackson at Glasgow University

Dr Cathy Dwyer

In September our MD Cathy Dwyer attended a 3-day meeting to commemorate heterogeneous catalysis research at the University of Glasgow and the career of Dr David Jackson, where she presented a paper titled " The Greening of Industry through Catalysis"

Reflecting the breadth of David's impressive career the meeting had significant industrial presence from organisations such as Johnson Matthey, Avantium Technologies, Koch Technology Solutions and SABIC. In addition to a range of academic colleagues . There was also significant representation from the UK Catalysis Hub

DROCHAID
RESEARCH SERVICES LTD

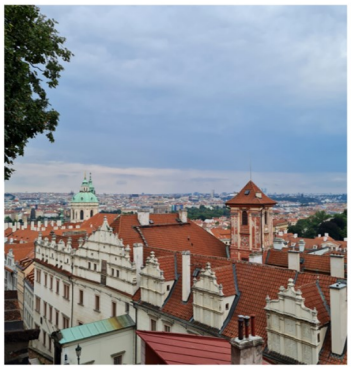
Dr Hendrik van Rensburg attends EuropaCat 2023 In Prague

Dr Hendrik van Rensburg In the beautiful city of Prague for EuropaCat 2023

Drochaid was proud sponsor of the poster at the event

[Dr Hendrik van Rensburg comments about his attendance at EuropaCat 2023]

"I attended the EuropaCat in the beautiful city of Prague. It was a good opportunity to network with friends from academia and industry"



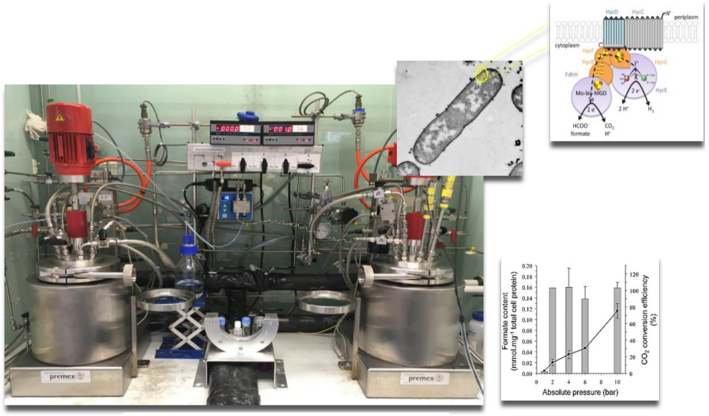
The annual company dinner celebrating a fantastic year
at Drochaid Research Services
September 2023

It was an outstanding year and September saw Drochaid's quarterly Board meeting where our financial year end results was presented, reflecting the commitment and technical excellence of our great team

We all celebrated with the Board members and are looking forward to building on our successes.

Dr Jianke Liu, Dr David Smith, Dr Simon Anetts
and Dr Phil Landon pictured with
"Scotties by the Sea"
Whilst visiting Eden Campus
Sculptures - Scotties by the Sea 2023

Case Study 1: A biological solution to Carbon Capture: High pressure bioconversion of CO_2 to formic acid using *E. coli*



A custom-built high pressure reactor system for Biocatalysis

Showcasing our capabilities in:
High-pressure, flammable gas handling
Real-time analysis and reaction monitoring
Multi-disciplinary, collaborative research

Reduction of carbon dioxide and other greenhouse gas emissions is an important net zero target. One approach is the recycling of waste CO_2 into useful chemicals. Our approach is to target the ability of E. coli to perform a mixed acid fermentation which produces formic acid. Formate hydrogenlyase (FHL), a redox enzyme comprising a molybdenum-dependent formate dehydrogenase linked to a nickel-dependent-hydrogenase, normally oxidises the resultant formate to carbon dioxide and couples that reaction directly to the reduction of protons to molecular hydrogen. However, understanding and harnessing the reverse reaction - hydrogen-dependent carbon dioxide reduction – has the potential to unlock FHL as an exciting new carbon capture technology.

In this work, it was established that FHL can operate as a highly efficient CO_2 reductase when gaseous CO_2 and H_2 are placed under pressure (up to 10 bar). Using intact whole cells, the pressurised system was observed to convert 100% of gaseous CO_2 to formic acid. Indeed, >500 mM formate was observed to accumulate in solution after 20 hours incubation. The applied gas pressure is critical to the efficiency of the reaction. In this regard our safe, expert capabilities of handling flammable gases at elevated pressures could be exploited in this unique application of biocatalysis.

In this project the collaboration between mathematicians, biologists and industrial chemists, which stems from a strong involvement in bioscience networks in the UK, was able to demonstrate the feasibility of this route to CO_2 valorisation. This paves the way to explore further modification of formic acid into other useful chemicals, using biotransformations.

"We value our collaboration with the group; not only have they brought to bear their considerable and complimentary technical expertise but have shown an open minded willingness to get involved in areas of technology entirely new to them"

"Together we have rapidly generated exciting new results".

Ian Fotheringham, Managing Director: Ingenza Ltd.

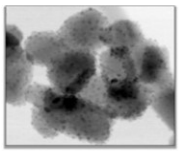
Case Study 2: High throughput screening of tailored multi-component metal supported catalysts: Higher Alcohol Synthesis (HAS)

Showcasing our capabilities in:
Tailored synthesis of heterogeneous catalysts
Advanced characterisation to elucidate physicochemical properties
High throughput testing of heterogeneous catalysts

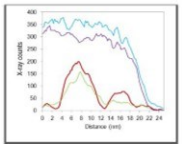
Historically, hydrogenation of carbon monoxide has been an important route for the transformation of synthesis gas (H2 + CO) derived from coal and natural gas into liquid fuels and chemicals. While Methanol Synthesis and Fischer-Tropsch chemistry are better known, Syngas-to-Olefins and Higher Alcohol Synthesis (HAS) processes have long been studied as interesting alternative routes to key chemical feedstocks.

Global dynamics relating to feedstock supplies and net zero imperatives have led to renewed interest in syngas-based conversions which can make use of biogenic CO_2 and green H_2. Drochaid's syngas conversion capabilities secured us a contract with a world leading energy and chemical player to investigate HAS chemistry and explore whether an economically viable process can be developed through significant improvements in reaction rate and selectivity.

Key performance indicators were evaluated for a range of HAS catalysts through the combination of:



Catalyst preparation to tailor the properties of multi-component metal-supported catalysts: Precise control of the synthesis resulted in a narrow particle size distribution using industrially relevant impregnation techniques.



Extensive characterization of the materials to determine their physico-chemical properties: The use of High-Resolution Transmission Electron Microscopy (HRTEM) and Energy Dispersive Spectroscopy (EDS) line scans showed an intimate interaction between metals in isolated particles.

High throughput screening of the catalytic systems:

This provided detailed comparative time-on-line information with regard to syngas conversion, full spectrum of products (selectivity) and stability, enabling a comparison of catalyst performance.

The combination of advanced characterization and high throughput screening techniques available at Drochaid provided our customer an accurate view of the crucial aspects of catalyst formulation, enabling them to continue with the next stage of their programme on the development of a commercial catalyst.

Dr Cathy Dwyer, MD is a keynote speaker at
Ready...Steady...Scale!

Agenda and Speaker Bio

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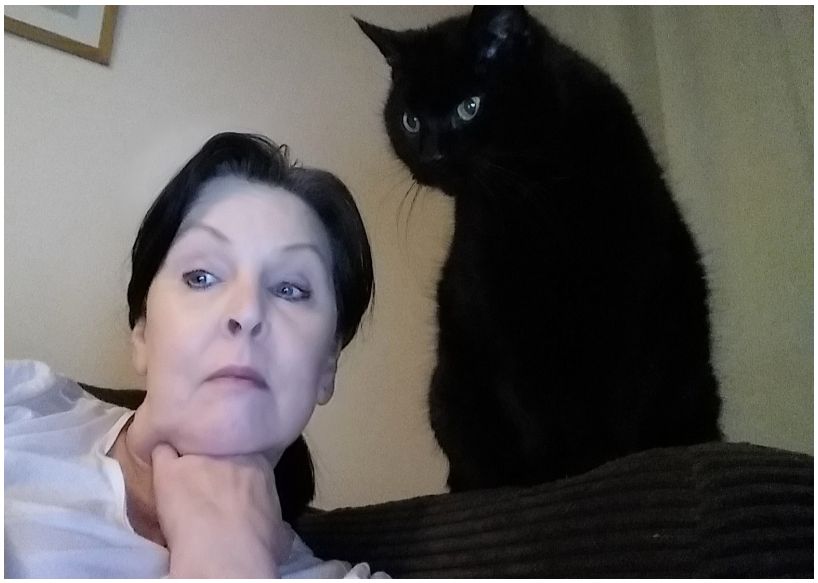
Johanna and T (the design supervising Cat)



Meet Johanna Jordan, Drochaid's PR and Administrator

Here Johanna is pictured with her cat named T, who is an elderly rescue now seeing out her days with an abundance of love and treats.

A key part of her job is keeping things organised and running smoothly, and acting as primary interface on our main phone line and email account.

She also handles key aspects of our PR – look out for a website update early in the new year.

T is also great company and takes great interest in any design work Johanna does.

Contact Us

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