

Working Towards Improved Production Routes for Crop Protection Agents

Chemists at the University of Glasgow are working in partnership with a leading chemical manufacturer to improve the efficiency of a hydrogenation reaction that is part of an industrial scale herbicide manufacturing process.

The best way to manufacture these high value chemicals is through heterogeneous catalysis, using precious metal-based catalysis to effect the required chemical transformations. One challenge for industry has been that the catalysts can exhibit a limited lifetime. As a result, after they have deactivated, the valuable metal needs to be recovered and the catalysts remade; an undesirable and expensive process.

Syngenta approached the University to understand the fundamentals of such heterogeneous hydrogenations, and to find a way of increasing the active lifetime of one of their catalysts used in their industrial operations. Working closely with the Company over a 3.5 year period, Ph.D. student Liam McMillan and Dr David Lennon (Reader in the School of Chemistry) have been carrying out research to identify the relevant chemical pathways active over these metal catalysts.

The researchers have just recently received £28,272 Knowledge Transfer Account (KTA) money that is funded by the Engineering and Physical Sciences Research Council (EPSRC), with the company providing additional funding for the project. Working at the University, they will be extending their studies in order to develop a kinetic model which describes how molecules are partitioned throughout the hydrogenation process.

From this laboratory-based research in Glasgow, the kinetic model will assist chemical engineers at the industrial centre in Bracknell in Berkshire to optimise the large-scale production chain. In this way, the kinetic model has the potential to act as a transformational tool.

An intended medium-term outcome from this collaboration is a reduction in the amount of waste materials, resulting in an improved, cleaner and more efficient process which will simultaneously save the company significant amounts of money in production costs.

Dr Lennon said: "This is a genuine academic-industry



link up with the University providing the fundamental knowledge that the industrialists can apply to improve the atom efficiency of the industrial process. This will allow the herbicide production chain to be more efficient, resulting in a process that is cleaner, greener and more sustainable."

Dr Colin Brennan, of Syngenta, said: "This collaboration has been based on developing fundamental understanding of the science involved. In this way the knowledge developed is available for future researchers to build on, whilst also providing a solid base for direct application in current real technology problems. The short term value is obvious but the longer term value of such sustainable working relationships cannot be over emphasised. It's also fun."

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