

A new 'metrics toolkit' to measure and evaluate how green a chemical reaction is

April 16 2015, by Saskia Angenent

Chemists at the University of York have developed a new 'metrics toolkit' to measure and evaluate how green a reaction is.

Developed within the CHEM21 project, a consortium of academics, [pharmaceutical companies](#) and enterprises working together to develop sustainable technologies for green chemical manufacture, the free metrics [toolkit](#) is available to researchers and chemistry students worldwide.

Designed to enable a consistent, universal measurement of sustainability for reactions in both laboratory and industrial settings, a range of criteria is assessed. These include new calculations for measuring a reaction's optimum efficiency (OE), renewable percentage (RP) and waste percentage (WP), in addition to a wide range of key parameters including health, safety, environment, energy and lifecycle considerations.

Using a colour coded system, the metric toolkit assesses each of these criteria and assigns a coloured flag, where green denotes 'preferred', amber implies 'acceptable with some issues', and red means 'undesirable'. The toolkit allows researchers and students to compare their reactions with existing methods, highlighting where their research is performing well in terms of its 'greenness' and suggesting areas where improvements could be made.

Available as an excel spreadsheet, the toolkit allows anyone to assess the

sustainability of their own reactions using both quantitative and qualitative data. It is hoped the toolkit will also be an important educational tool, promoting the use of greener and more sustainable techniques for a new generation of chemists.

Professor James Clark, Director of York's Green Chemistry Centre of Excellence and an author of the project, said: "The CHEM21 Innovative Medicines Initiative project has allowed us to work closely with some of the world's largest pharmaceutical companies and we have learned how modern thinking in [green](#) and [sustainable chemistry](#) is best applied to that industry.

"This publication is the culmination of our work with the industry on identifying the critical resource and process factors that impact on most pharmaceutical manufacturing processes. It shows a practical way forward on how the industry, and other chemical manufacturing industries, can continue to supply vital products for society in a sustainable way."

More information: "Towards a holistic approach to metrics for the 21st century pharmaceutical industry." pubs.rsc.org/en/content/article/2015/GC/C5GC00340G

The Excel spreadsheet is available for free here:
www.rsc.org/suppdata/c5/gc/c5g...40g/c5gc00340g1.xlsx

Provided by University of York

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