Green Chemistry Centre of Excellence

Training, Education and Networks
TRAINING, EDUCATION AND NETWORKS (TEN)

The Green Chemistry Centre of Excellence (GCCE)’s TEN platform facilitates interaction between the technical platforms and industry, government organisations, NGOs and other academic groups. By bringing together appropriate partners to build robust consortia, the TEN team provide a vital role in winning funding for the GCCE.

EDUCATION AND TRAINING

The TEN platform is instrumental in providing high quality training and educational material across higher education and industry, with internal and external continuous personal development programs including online courses, seminars, workshops and a Masters degree course. The MSc in Green Chemistry and Sustainable Industrial Technology is the first course of its kind to be accredited by the Royal Society of Chemistry. We deliver excellence in education and training within an infrastructure that produces top quality and employable MSc and PhD graduates in green and sustainable chemistry.

CHEM21 Online Learning Platform*

As a partner in the EU IMI CHEM21 project, the GCCE led on the creation of a bespoke e-learning platform that was developed with the aim of promoting uptake of green and sustainable methodologies, with a particular focus on the synthesis of pharmaceuticals. The CHEM21 online learning platform comprises a range of free, shareable and interactive educational and training materials that have been created in collaboration with industry.

The platform covers a broad range of topics, both at an introductory level and in-depth under the following topics:
- Foundation
- Guides and Metrics
- Solvents
- Synthetic Toolbox
- Process Design
- Life Cycle Impacts and the Environmental Fate of Pharmaceuticals

Each learning module stands alone, so the user can pick and choose from a wealth of resources to create a learning path appropriate to their needs.

Graduate Training Workshops – RenewChem

The GCCE’s RenewChem initiative incorporates graduate training as one of its core activities and this training is specifically aimed at equipping future employees of the chemical industry with the requisite skills and knowledge to make an immediate impact on the transition to green manufacturing and circular economy within the chemical industries. An annual series of interactive workshops delivered by experts from departments across campus and industry are organised by the GCCE around the theme of Sustainable Manufacturing for the Chemical Industry.
Outreach

The GCCE strongly believes in the importance of raising awareness of green chemistry in school children and the general public. We have a proven track record of preparing and delivering high quality promotional and awareness activities. Staff and students at the Centre regularly participate in outreach activities, including: running hands on science workshops and exhibitions; delivering school and public lectures; publishing in educational journals and creating educational websites and other resources. The GCCE has also recently been involved in a project to create a book on green chemistry for primary school children using a ‘students as partners’ approach. Aimed at children aged 11+, The Green Formula can be downloaded for free from iTunes.

Metrics Toolkit*

The GCCE, as partners in the EU IMI CHEM21 project, developed a unified Metrics Toolkit that is freely available for users to comprehensively evaluate the sustainability of chemical and biochemical reactions based on a series of key parameters. The Toolkit is specifically structured with a series of ‘passes’ to cover everything from bench top research right through to industrial scale with increasing level of complexity.

Solvent Selection Guide*

The GCCE also worked with Sanofi, Pfizer, GlaxoSmithKline and CTC Ltd to develop a unified solvent selection guide to promote the use of sustainable solvents also as part of the CHEM21 project. This guide has now been adopted by the ACS Green Chemistry Institute as its recommended method of selecting greener solvents. The guide allows bio-derived solvents for the first time to be assessed on a level playing field with their petroleum-derived counterparts. Solvents are also helpfully grouped into solvent families to make it easier to select ‘best in class’. Uniquely for a solvent selection guide, the user can rank any solvent of their choice via the same methodology via a user-friendly online tool.

Continuing Professional Development - Online course in Solvent Selection and Substitution

The GCCE have developed an online CPD course in Solvent Selection and Substitution that has been specifically designed to assist delegates with identifying and understanding the properties of solvents, and equip them with the tools to approach solvent substitution in a systematic way that allows performance to be maintained with benign solvents. The course is relevant to those working within the chemical (and related) industries as well as academics and students with an interest in solvent replacement strategies.
NETWORKS

The GCCE has significant experience of initiating, administering and running national and international networks bringing together researchers working in complementary areas to further a wide-range of different aspects of green and sustainable chemistry.

The **World Food Waste Network** (formerly the EUBiS COST Action) is an international network of researchers working together to advance research on the valorisation of food supply chain waste for the production of sustainable chemicals, materials and fuels. See www.worldfoodwaste.org.

**CO2Chem** is an EPSRC Grand Challenge Network. CO2Chem brings together academics, industrialists and policy makers over a wide range of disciplines to consider the utilisation of carbon dioxide as a single carbon chemical feedstock for the production of value added products. See co2chem.co.uk.

**G2C2** is a global network connecting established and fledgling Green Chemistry Centres initially established in 2013. The aim is to promote Green Chemistry in academia, industry and policy through mutually supportive development in the following areas: Networking, Education, Outreach, Industrial collaboration, Funding opportunities, and Policy advancement. See g2c2.greenchemistrynetwork.org.

**CITED WEBSITES**

1. www.york.ac.uk/msc-green-chemistry
4. www.york.ac.uk/renewchem
5. http://dx.doi.org/10.1039/C5GC01008J
6. https://tinyurl.com/y9jbyagp
7. https://tinyurl.com/y8asp35c
8. http://dx.doi.org/10.1039/C5GC00340G
9. www.york.ac.uk/greenchemistry-cpd
10. https://tinyurl.com/ydan5tro

* The CHEM21 online learning platform, solvent selection guide and metrics toolkit were all developed as part of the IMI funded CHEM21 project (Chemical Manufacturing Methods for the 21st Century Pharmaceutical Industries). CHEM21 has received funding from the Innovative Medicines Initiative Joint Undertaking under grant agreement nº115360, resources of which are composed of financial contribution from the European Union’s Seventh Framework Programme (FP7/2007-2013) and EFPIA companies’ in kind contribution.