



# SCIENTIFIC UPDATE

*We've got chemistry*

## FLOW CHEMISTRY

7-8 JUNE 2018

**Milan, Italy**  
Hilton Milan

"Very helpful course, the range of examples given demonstrated very well the applicability of flow chemistry."

**Ipsen Manufacturing Ireland Ltd**



A 2 day course given by  
**Professor C Oliver Kappe**  
and **Dr Will Watson**

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# FLOW CHEMISTRY

A 2 day course given by  
Professor C Oliver Kappe and Dr Will Watson

7-8 June 2018 Milan, Italy, Hilton Milan

Multiple attendees discounts  
**UP TO 15%** available

## INTRODUCTION

Flow chemistry has been used in petrochemical and bulk chemical production for over 100 years but has only really been taken up in the pharmaceutical and fine chemical industries over the last 10 years or so.

This course aims to give an introduction to the subject and an overview of the current state of the art. A variety of chemical reactions in flow and how to translate a conventional reaction in to a flow process will be described.

This also entails choosing the right type of flow reactor for the chemistry, and a number of different flow reactor systems will be discussed and compared. Handling solids in flow systems, inline and online monitoring of flow reactions will also be covered along with the hazards and pitfalls associated with scaling up flow reactions.

## WHAT WILL ATTENDEES GAIN?

- > What is flow chemistry/ microreaction technology and why go flow
- > Which types of chemistry are most likely to benefit from being run in flow systems
- > How to convert an existing lab reaction in to a flow process
- > The choice of flow reactors available and when the choice of reactor is likely to be important
- > Practical tips associated with safety and scale up of flow reactions

## COURSE OUTLINE

### 1. Introduction to Flow Chemistry and Microreactors

- General references
- Basic principles/advantages of microreactor technology: definitions, mixing efficiency, flow regimes, heat and mass transfer
- Equipment review: microreactors, mesofluidic/tubular reactors, cartridge-based systems
- Operative principles in flow: residence time, flow rate, back pressure, yield

### 2. Microreactor Chemistry Concepts / Examples

- Strongly exothermic and/or fast reactions, "flash chemistry", hazardous chemistry and processes
- Special techniques: flow photochemistry, electrochemistry, enzymatic reactions

Problem Session 1 - Group Work

### 3. General Flow Chemistry Examples

- Homogeneous liquid-phase reactions
- Multi-phase reactions (liquid/liquid, liquid/solid)
- Reactions with gaseous components: gas, gas/liquid, gas/liquid/solid

### 4. High-Temperature / Pressure Flow Chemistry

- Flow chemistry in high-T/p process windows (Novel Process Windows), translating microwave protocols to flow, flow microwave chemistry

### 5. Physical and Analytical Aspects of Flow Chemistry

- Handling solids in flow systems
- Inline / online reaction monitoring
- Regulatory aspects related to the development of flow processes

Problem Session 2 – Group Work

### 6. Scaling up Flow Reactions

- Industrial examples of microreactor technology
- Choice of equipment
- Reaction conditions

### 7. Case Studies in Flow Chemistry

- Examples from Pharmaceuticals and fine chemicals

### Question and Answer Session

"This course was very useful to get information about what Flow Chemistry can achieve. Totally up to date. It was very interesting to know which equipment is used nowadays".

## VENUE

### Hilton Milan

Via Luigi Galvani, 12,  
20124 Milano, Italy

[www3.hilton.com/en/hotels/italy/hilton-milan-MILHITW/index.html](http://www3.hilton.com/en/hotels/italy/hilton-milan-MILHITW/index.html)

This sophisticated hotel is a 3-minute walk from the Centrale metro station and 3.7 km from Santa Maria delle Grazie, which houses Leonardo da Vinci's The Last Supper.

The upscale rooms and suites come with Wi-Fi (fee), flat-screen TVs and desks, other amenities include a gym.

You can either book directly with the hotel via their website or we will also send you a list of near by hotels.





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**Start** 9.00am - Thursday 7 June

**Finish** 4.30pm - Friday 8 June

**Course dinner** 7.00pm - Thursday 7 June

**Course Fee:** €1,800

Which includes comprehensive course manual, refreshments throughout the day, lunch and one course dinner.

**Course Fee:** €1,800

## COURSE TUTORS

### Professor C Oliver Kappe

University of Graz

C. Oliver Kappe received his diploma- (1989) and his doctoral (1992) degrees in organic chemistry from the University of Graz where he worked with Professor Gert Kollenz on cycloaddition and rearrangement reactions of acylketenes. After periods of postdoctoral research work on reactive intermediates and matrix isolation spectroscopy with Professor Curt Wentrup at the University of Queensland in Brisbane, Australia (1993-1994) and on synthetic methodology/alkaloid synthesis with Professor Albert Padwa at Emory University in Atlanta, USA (1994-1996), he moved back to the University of Graz in 1996 to start his independent academic career. He obtained his "Habilitation" in 1998 in organic chemistry and was appointed Associate Professor in 1999. Since 2011 he holds the position of Professor of "Technology of Organic Synthesis" (Organische Synthesetechnologie) at the University of Graz. He has spent time as visiting scientist/professor at e.g. the Scripps Research Institute (La Jolla, USA, Professor K. Barry Sharpless, 2003), the Toyko Institute of Technology (Toyko, Japan, Professor T. Takahashi, 2008), the University of Sassari (Sassari, Italy, 2008), the Sanford-Burnham Institute for Medical Research (Orlando, USA, 2010) and the Federal University of Rio de Janeiro (Rio de Janeiro, Brazil, 2013). The co-author of more than 300 publications, his main research interests have in the past focused on multicomponent reactions, combinatorial chemistry and the synthesis of biologically active heterocycles. More recently his research group has focused on the use of enabling and process intensification technologies for synthetic chemistry, including microwave and continuous flow processing. For his innovative work in microwave chemistry he received the 2004 Prous Science Award from the European Federation for Medicinal Chemistry and the 2010 Houska Prize (€100.000) in addition to a number of other awards.



### Dr Will Watson

Technical Director,  
Scientific Update

Will Watson gained his PhD in Organic Chemistry from the University of Leeds in 1980. He joined the BP Research Centre at Sunbury-on-Thames and spent five and a half years working as a research chemist on a variety of topics including catalytic dewaxing, residue upgrading, synthesis of novel oxygenates for use as gasoline supplements, surfactants for use as gasoline detergent additives and non-linear optical compounds. In 1986 he joined Lancaster Synthesis and during the next 7 years he was responsible for laboratory scale production and process research and development to support Lancaster's catalogue, semi-bulk and custom synthesis businesses. In 1993 he was appointed to the position of Technical Director, responsible for all Production (Laboratory and Pilot Plant scale), Process Research and Development, Engineering and Quality Control. He helped set up and run the Lancaster Laboratories near Chennai, India and had technical responsibility for the former PCR laboratories at Gainesville, Florida. He joined Scientific Update as Technical Director in May 2000. He is also involved in an advisory capacity in setting up conferences and in the running of the events. He is also active in the consultancy side of the business.



 [will@scientificupdate.com](mailto:will@scientificupdate.com)

## IN-HOUSE COURSE

For 8+ people contact us to discuss holding this event In-House -  
[sciup@scientificupdate.com](mailto:sciup@scientificupdate.com)

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When you register online, you can have the option to pay via credit card (Mastercard or Visa). A receipted invoice will be automatically generated once paid and sent via email. Should your company wish to pay by cheque or bank transfer bank details will be supplied with an invoice.

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### Confirmation of your registration

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### Late Applications

For late applications, please register online or fax the completed registration form, including credit card payment information.

### Cancellations/Refunds

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7-8 June 2018 Milan, Italy

No. of attendees  @ €1800

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 Register 3 delegates and receive 10% on 3rd booking  
 Register 4 or more delegates and receive a 15% discount

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**Cancellations**  
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