

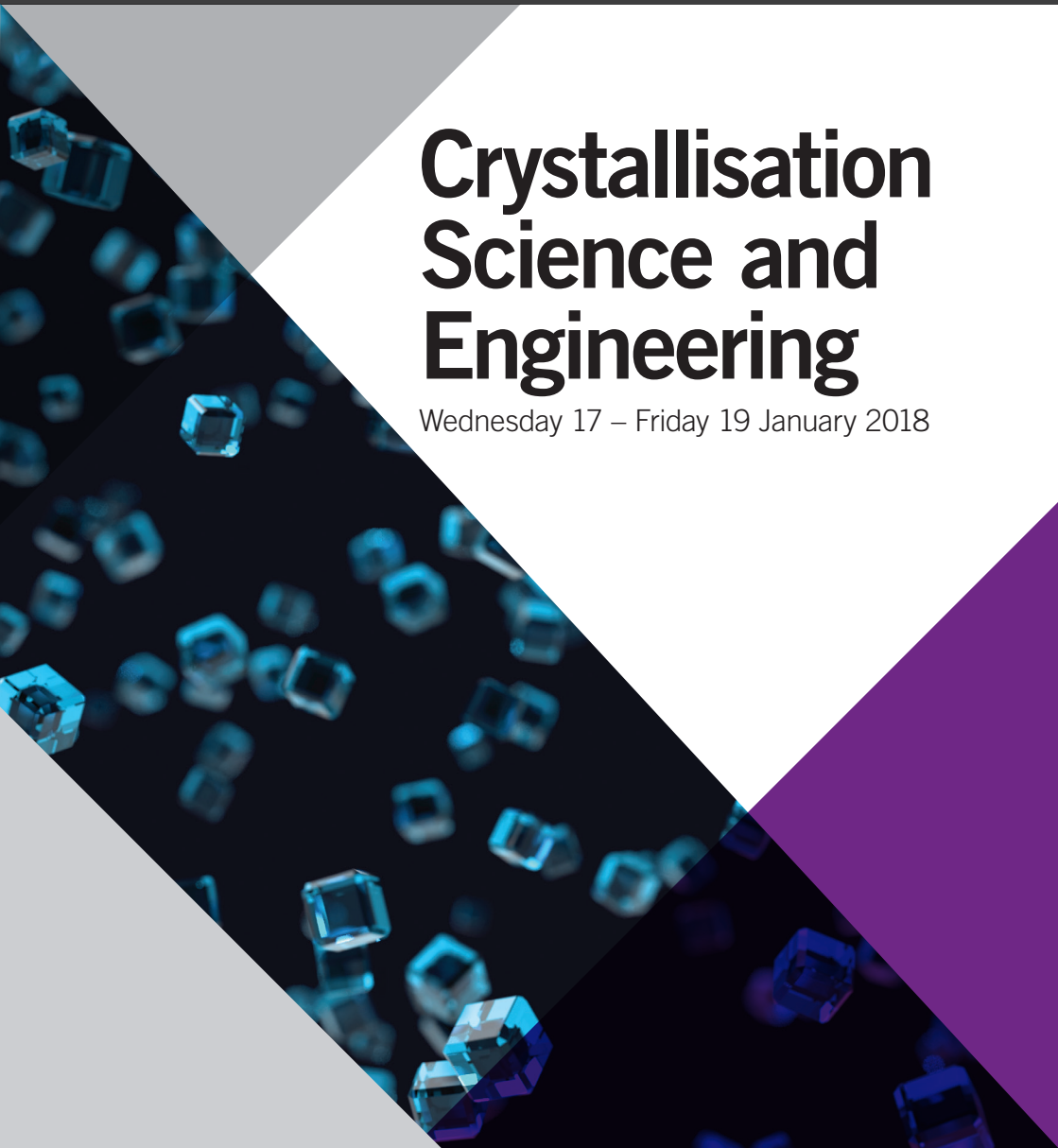
**School of Chemical and
Process Engineering**
FACULTY OF ENGINEERING



UNIVERSITY OF LEEDS

Crystallisation Science and Engineering

Wednesday 17 – Friday 19 January 2018



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About the course

This 3 day short course will outline the fundamental science and engineering of crystallisation processes. The course will also include laboratory experimental sessions to demonstrate crystallisation processes, application of advanced process analytical technologies (PATs) and particle characterisation techniques. The delegates will have hands-on opportunities to use crystallisation modelling software. The course will be delivered by academic and industrial experts in the field and will include case studies.

Course aims

Delegates will leave with the basic knowledge that they can use in their industrial work and a deeper understanding of crystallisation science and technology to assist in process development and scale-up of the manufacture of crystals for desired properties. The course will also give delegates the tools to be able to better engage with experts when needed.

Who should attend

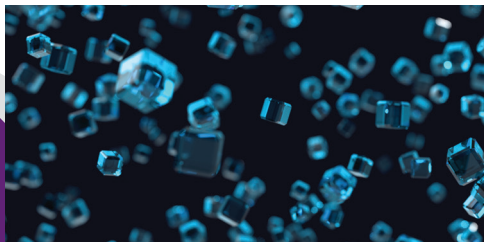
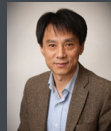
This course is aimed at engineers and scientists working in industries on crystallisation process development, scale-up, control and operations. It will also be of interest to post-graduates and post-docs involved in research in the general area of crystallisation.

Course Directors

Dr Tariq Mahmud is an Associate Professor in Chemical Engineering. His expertise lies in industrial crystallisation process development, scale up and control. He also has extensive expertise in integrated CFD-process modelling encompassing development and validation of process models coupled with CFD of turbulent and multi-phase flow systems and nano-/micro-size particulate synthesis processes via crystallisation, reactive precipitation and spray drying. He has led a number of experimental and modelling projects in these areas, as Principal- or Co-investigator, funded by the UK EPSRC, Innovate UK and industry including AstraZeneca, GSK, Pfizer, P&G, NNL and Syngenta. Tariq is currently a committee member of the British Association for Crystal Growth (BACG) and jointly chaired their 45th and 47th Annual Conference held in July 2014 and June 2016 at Leeds, and a Council member of the European Network for Crystal Growth.



Dr Xiaojun Lai is a Lecturer in Pharmaceutical Engineering and has research interests in the application of process-related analytical and characterisation techniques to studies of crystallisation and precipitation processes. He has used reaction calorimetry for studying process thermodynamics, NIR spectroscopy and video microscopy for particle monitoring, Raman technique for multiple component crystallisation system characterisation, and in situ XRD for phase transformation investigation. He has also developed instrumentation for combined X-ray topography and multiple diffraction for the characterisation of lattice defects in crystals and made significant use of SR techniques, for in situ probing of crystal structure during practical processing and X-ray spectroscopy for probing impurity impact on crystal growth.



Programme

Wednesday 17 January 2018

08:45 Registration and coffee

09:15 Introduction

Crystallisation Fundamentals

09:30 Crystallisation route map
Professor Kevin Roberts
SCaPE, University of Leeds

10:15 Nucleation & crystal growth
Dr Diana Camacho
SCaPE, University of Leeds

11:00 Coffee

11:15 Crystal morphology & habit modification
Dr Ian Rosbottom
SCaPE, University of Leeds

12:00 Fundamentals of polymorphism
Dr Robert Hammond
SCaPE, University of Leeds

12:45 Lunch

13:30 Solid-state analysis
Dr Gerry Steele
PharmaCryst Consulting Ltd

14:15 Screening for polymorphs (solid form selection)
Dr Bob Docherty
Pfizer, Sandwich
(to be confirmed)

15:00 Characterisation of pseudo polymorphs (TGA, DVS, IGC)
Dr Gerry Steele
PharmaCryst Consulting Ltd

15:45 Tea

Laboratory Demonstrations

16:00 D1 – Nucleation kinetics
Dr Diana Camacho
& Dr Tariq Mahmud
SCaPE, University of Leeds

D2 – Growth kinetics
Dr Xiaojun Lai
& Dr Tom Turner
SCaPE, University of Leeds

17:15 End of day one

19:00 Course dinner

Thursday 18 January 2018

08:45 Coffee

Crystallisation Processes

09:00 Batch crystallisation: Process development & scale up
Professor Chris John Price
Chemical & Process Engineering,
University of Strathclyde

09:50 Hydrodynamics, mixing & heat transfer in batch crystallisers
Dr Tariq Mahmud,
SCaPE, University of Leeds

10:40 Coffee

10:55 Continuous crystallisation: Process development & scale up
Christian Melches, GEA

11:45 Solvent selection: properties and solubility
Professor John Blacker
School of Chemistry,
University of Leeds

12:30 Lunch

13:15 Post crystallisation unit operations: Filtration and drying
Dr Amgad Moussa
Syngenta

Measurements & Control

14:00 Particle size measurements & characterisation
Dr Tina Bonakdar
SCaPE, University of Leeds

14:40 Tea

14:55 Particle properties & performance
Dr Richard Storey
Astra Zeneca

15:35 Process spectroscopic techniques (IR, UV-vis, Raman)
Dr Xiaojun Lai
SCaPE, University of Leeds

Laboratory Demonstrations

16:15 D3 – Particle characterisation
Dr Tina Bonakdar
SCaPE, University of Leeds

D4 – Raman spectroscopy
Dr Xiaojun Lai
SCaPE, University of Leeds

17:30 Poster and drinks reception followed by close of day two

Friday 19 January 2018

08:45 Coffee

Measurements & Control (cont.)

09:00 Control of crystallisation processes for PSD
Dr Tariq Mahmud
SCaPE, University of Leeds

Co-Crystals

09:45 Fundamentals of co-crystallisation and case studies of recent developments
Dr Mingzhong Li
De Montfort University
Professor Anant Paradkar
University of Bradford

11:15 Coffee

Crystallisation Modelling & Software Demonstrations

11:30 Molecular to crystal science modelling route map
Dr Robert Hammond
SCaPE, University of Leeds

12:15 Software demonstration: VISUAL HABIT
Dr Jonathan Pickering
SCaPE, University of Leeds

13:00 Lunch

13:45 Population balance modelling of crystallisation processes
Dr Antonia Borissova
SCaPE, University of Leeds

14:30 Model-based design of crystallisation processes
Niall Mitchell
Process Systems Enterprise (PSE), London

15:15 Software demonstration: The gCRYSTAL modules of gPROMS FormulatedProducts
Dr Niall Mitchell
PSE

16:00 Wrap-up and feedback from delegates
Dr Xiaojun Lai
Dr Tariq Mahmud

The full course details and online booking are now available from the course web page: www.engineering.leeds.ac.uk/short-courses

Further Information

Venue

The course venue will be within the Faculty of Engineering at The University of Leeds. Please note, car parking for visitors is unavailable at the University. The nearest public car park is Woodhouse Lane (multi storey) at LS1 3HQ.

Course fees

The following course fees include the cost of tuition, course materials, refreshments, lunches and the course dinner:

£1050 until 15 December 2017

£1125 after 15 December 2017

Discount available to full time PhD students

Accommodation

Delegates are responsible for their own accommodation, if required. A list of hotels close to the University will be sent out with the delegate joining instructions.

Course dinner

The course dinner will take place at a Leeds city centre restaurant on Wednesday evening and is included in the course fee. The dress code is smart casual.

Accessibility

Please let us know if you have any specific requirements including any access or dietary requirements in relation to this course.



How to book

Booking for this course should be completed through our secure online store (via debit/credit card). To complete your booking please follow the instructions below:

Online booking

1. Log on to our online store at **<https://store.leeds.ac.uk>**
2. Select Conferences and Events in the left-hand navigation bar.
3. Select CPD Faculty of Engineering
4. Select the course or event for which you wish to register and click on 'Book'
5. If you are a new user, please follow the instructions to register. If you already have an account log in as instructed.
6. Complete the application process as directed by the booking system.

You will receive an automatic confirmation email within 24 hours of your booking.

For online booking queries and for all other enquiries please contact:

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CPD, Conference & Events Unit
Faculty of Engineering
School of Chemical and Process Engineering, 3.11
University of Leeds
LEEDS, LS2 9JT, UK

T: +44 (0)113 343 2494/8104

E: cpd@engineering.leeds.ac.uk

W: www.engineering.leeds.ac.uk/short-courses

 [@LeedsUniCPD](https://twitter.com/LeedsUniCPD)

Terms and conditions for booking

Payment in full should accompany your booking. The course fee is exempt from VAT. Fees must be paid in full no later than 15 working days before the course commences. Failure to pay may result in attendance being refused.

Registrations are accepted on the understanding that the printed programme is given in good faith but may have to be re-scheduled or the speakers changed for reasons outside our control. The University of Leeds reserves the right to cancel or postpone the course, in which case fees will be refunded in full. In the event of cancellation, the University will not be held liable for delegates travel or accommodation expenses.

Delegates will receive a full refund for cancellations made within 7 days of online booking, except where the booking has been made for an event commencing within the next 7 days. Where a delegate wishes to cancel a registration after this 7 day period, written cancellations received up to 15 working days before the course will be subject to an administrative charge of 20% of the total remittance. After this date the full fee is chargeable and no refunds will be made, this also applies for non-attendance but copies of the course documents will be sent. Substitutions may be made at any time.

If you are unable to complete your registration using the online booking system please contact the CPD, Conference & Events Unit to discuss alternative arrangements.