



Future Formulation IV

Tuesday 23 June 2020

Online Meeting

Conference Booklet



Welcome to Future Formulation IV

The Formulation Science and Technology Group is a subject group of the Royal Society of Chemistry, London. It is the leading scientific organisation dedicated to product formulation and acts as a community for the exchange of knowledge in formulation in its broadest sense. As a charitable organisation, it works for the benefits of its members and to further the awareness of formulation science. It fosters the advancement of formulation science across many scientific disciplines and industrial applications, including pharmaceuticals, cosmetics, foods and detergents. It is a point of focus for all industrialists and academics engaged in the practice of formulation science. The RSC-FST organises many events during the year for the benefit of its members, including conferences, training days, and networking events. This year we have moved to a virtual platform for dissemination and this is our first online event. This has allowed for a wider global reach – please take advantage to network with the formulation community from across the world during the meeting.

Formulation is by necessity an integrating field bringing together the wide range of different scientific disciplines needed to achieve a formulated product. The aim of the meeting is to provide a forum to showcase advances which will shape future formulation and provide insight into projects which have now been running for over two years and have now started tackling some of the difficult formulation challenges across a diverse range of applications.

The first Future Formulation meeting was held in Durham in 2017, just after the Future Formulation of Complex Products grants had started, so the second Future Formulation meeting was an opportunity to hear about the exciting progress being made towards the future of formulation, the third Future Formulation meeting gave the researchers the opportunity to update us on their individual projects and through interactive sessions provided further details and gave us the opportunity to contribute to the development of the projects. This fourth Future Formulation sees the grants coming to an end, so you will get to hear about all that has been accomplished during the grants and to be part of the discussions about what to do next.

The UK has in recent years recognised the massive contribution which formulation makes to its economic activity, resources have been made available both through the setting up of the National Formulation Centre in County Durham and specific funding calls from EPSRC and Innovate UK. This meeting brings together some of the people who are shaping future formulation having been awarded grants under the EPSRC's *Future Formulation of Complex Products* call.

The RSC-FST is grateful to the University of Edinburgh and Dr Jin Sun for their support in hosting Future Formulation IV virtually.

Thank you for your participation. We hope you find the day both enjoyable and informative.

Future Formulation IV: Organising Committee

Professor Simon Gibbon, AkzoNobel RD&I

Simon is Secretary of the Formulation Science and Technology Group, he has an appreciation of the challenges of successful formulation, having spent over 30 years working on formulations from non-stick cookware, through personal care and cleaning, to oil recovery. He is currently Corrosion Protection Community of Practice Leader for AkzoNobel, responsible for knowledge management across the company, where advances in characterisation provide the mechanistic understanding which drive the continually improving corrosion protection formulations.

Dr Philip P Gill, Cranfield University

Phil is a committee member of the Formulation Science and Technology Group, and is a physical chemist specialising in characterising and formulation of solid propellant chemistry. He is a nationally recognised expert in the field of energetic materials with over 20 years' experience. His research team is focused on the life assessment, manufacture and formulation of solid propellants. Current research topics include: (i) resonant acoustic mixing (RAM) to formulate the next generation composite rocket propellants; (ii) understanding the swelling and gelling behaviour of nitrocellulose for an improved understanding of min-smoke propellants.

Dr Helen Ryder, The University of Manchester

Helen is the Chair for the Formulation Science and Technology Group. Helen obtained her PhD at The University of Manchester working on 'The Behaviour of Surfactant Lamellar and Gel Phases Under Flow'. She is currently a Research and Facilities Manager for Henry Royce Institute, the UK's National Centre for Advanced Materials. Helen specifically supports the extensive and innovative imaging and characterisation at The University of Manchester.

Dr Jin Sun, The University of Edinburgh

Jin is a Reader in the School of Engineering at the University of Edinburgh. His main research interests are in the rheology and flow of dense particle systems in industrial and natural environments, such as manufacturing of ceramics, food stuff, battery electrodes and pharmaceuticals and debris and pyroclastic flows. He develops constitutive models and uses multiscale computation to study how particle scale dynamics and mechanics affect the macroscopic behaviour of such materials. He held a Royal Academy of Engineering/ Leverhulme Trust Senior Research Fellowship to explore the novel application of suspension rheology in 4D printing technology and is a committee member of the Particle Technology Special Interest Group of The Institution of Chemical Engineers.

Future Formulation IV: Programme

Note: You must be registered to join the meeting

Abstracts are available in the booklet & online (follow links in programme)

| LOCATION: Online – Zoom/YouTube Meeting | |
|---|--|
| 09:45-10:00 | Please join the online event – links in joining instruction emails |
| 10:00-10:15 | Welcome: Dr Phil Gill & Dr Helen Ryder |
| Session 1 – Professor Simon Gibbon (Chair) | |
| 10:15-10:45 | <u>Establishing principles for formulation and processing of high-solids-content dispersions of complex compositions in complex flow</u> Dr Jin Sun, University of Edinburgh |
| 10:45-11:15 | <u>Virtual Formulation Laboratory for prediction and optimisation of manufacturability of advanced solids based formulations</u> Professor Csaba Sinka, University of Leicester |
| 11:15-11:45 | <u>Evaporative Drying of Droplets and the Formation of Micro-structured and Functional Particles and Films</u> Professor Andrew Bayly, University of Leeds |
| 11:45-12:15 | <u>Enabling rapid liquid and freeze-dried formulation design for the manufacture and delivery of novel biopharmaceuticals</u> Professor Paul Dalby, UCL & Dr Robin Curtis, The University of Manchester |
| 12:15-12:30 | <u>Update from EPSRC and UKRI to include future funding opportunities and capturing impact from Future Formulation grants.</u> Dr Stephanie Williams, UKRI-EPSRC |
| 12:30-12:35 | <u>A special issue of ChERD - Future Formulation</u> Prof Csaba Sinka, University of Leicester |
| 12:35-13:30 | LUNCH BREAK |
| Session 2 – POSTERS – Dr Jin Sun (Chair) | |
| 13:30-14:30 | Poster Session (3 min elevator pitch) |
| Session 3 – Dr Helen Ryder (Chair) | |
| 14:30-15:00 | <u>INFORM 2020: Deconstructing the Role of Powder Agglomerates in Inhaled Powders</u> Professor Darragh Murnane, The University of Hertfordshire |
| 15:00-15:30 | <u>Formulation for 3D printing</u> Professor Ricky Wildman, University of Nottingham |
| 15:30-16:00 | <u>CORAL - Viscoelastic effects during processing of complex fluids</u> Professor Panagiota Angeli, Dr Tom Lacassange, & Giovanni Meridiano, University College London |
| 16:00-16:10 | Concluding Remarks: Dr Phil Gill & Professor Simon Gibbon |
| 16:10 | Finish and close |

Future Formulation IV: Abstracts

Grant: Predictive formulation of high-solid-content complex dispersions

Pls: Dr Jin Sun, University of Edinburgh & Dr Mark Haw, University of Strathclyde

10:15-10:45 – Oral Presentation:

Establishing principles for formulation and processing of high-solid-content dispersions of complex compositions in complex flows.

Dr Jin Sun, University of Edinburgh.

Abstract: High-solid-content dispersions of solid particles of size about 1-50 microns in a liquid phase (HSCDs) occur ubiquitously in industrial applications, from cement and ceramic pastes to catalyst washcoats, paints, foods and drilling fluids. The reliable and efficient processing and manufacture of these diverse products presents 'grand challenges' to formulation technology because at high solids volume fraction process flow and product behaviour become increasingly unstable and unpredictable.

Poster Presentation:

Tuning the particle interactions in non-model suspension

Lewis Mchale, University of Edinburgh.

Abstract: Granular suspensions are widespread in multiple industries however the unification of multiple non-Newtonian affects such as shear thickening and shear thinning is not well understood. Here we use the mean field constraint theory to understand non-model silica which can be tuned between multiple rheologies using surfactant. Novel techniques allow us find that heterogeneous surface chemistry leads to unexpected rheologies and so a produced an understanding of this system from the atomic, particle and macroscopic scales.

Grant: Virtual Formulation Laboratory for prediction and optimisation of manufacturability of advanced solids based formulations

PI: Dr Csaba Sinka, University of Leicester

10:45-11:15 – Oral Presentation:

Virtual Formulation Laboratory for prediction and optimisation of manufacturability of advanced solids based formulations.

*Sinka I.C. *, Ghadiri M., Heng J.YY., Bradley M.S.A., Davidchack R., Jia X., Berry M.R., Edmans B.D., Pasha M., Karde V., di Pasquale N., Kahrizangi H.S. University of Leicester.*

Abstract: Virtual Formulation Laboratory (VFL) is a software tool for prediction and optimisation of manufacturability and stability of advanced solids-based formulations. Four processes are considered: powder flow, mixing, compaction and storage. VFL predicts manufacturability problems quantified by suitable manufacturability indicators and accounts for a range of material types, particle structures and blend systems to enable the formulator to test the effects of formulation changes in virtual space and check for potential problems covering manufacturing difficulties experienced in production plants. In this overview the science base for understanding of surfaces, particulate structures and bulk behaviour to address physical, chemical and mechanical stability during processing and storage is introduced. The manufacturability indicators are predicted from bulk properties which are linked to particle properties and molecular information. Demonstration case studies are presented for the four manufacturing processes and problems. The talk will be followed by a more detailed presentation of the VFL approach to powder compaction.

Grant: Evaporative Drying of Droplets and the Formation of Micro-structured and Functional Particles and Film

PI: Professor Colin Bain, Durham University

11:15-11:45 – Oral Presentation:

Evaporative Drying of Droplets and the Formation of Micro-structured and Functional Particles and Films.

Professor Andrew Bayly, University of Leeds.

Abstract: The evaporation of sessile droplets can be a useful method to pattern substrates, with inkjet printing technology being particularly good at the selective deposition of functional materials. A predictive understanding of formulations is necessary in order to design systems in which the internal flows generated during drying do not lead to undesirable non-uniform morphologies.¹ Composition or temperature gradients across the liquid-vapour interface have been shown to induce Marangoni flows which can redistribute suspended material,² however studies have mainly taken place on microlitre droplets.

Poster Presentations:

Wetting and drying of aqueous droplets with non-ionic surfactants CnEm.

Jing Shi, Lisong Yang, Colin Bain, University of Durham.

Single droplet drying kinetics and particle formation from a colloidal suspension microdroplets.

J. Archer, J. S. Walker, F. K. A. Gregson, D. A. Hardy and J. P. Reid, University of Bristol.*

Abstract: Industrial processes such as spray drying of pharmaceutical and food products often involve the drying of aerosol droplets containing colloidal suspensions into powdered microparticles of desired properties. The morphology and surface properties of the final dry products/microparticles obtained after the drying process are strongly influenced by the parameters of the initial aerosol droplet composition and the drying conditions. In particular, the final dry microparticle morphology can be dependent on the dimensionless Péclet number (Pe), which express the relative competition between the diffusion of the dispersed particles within the droplet and the rate of solvent loss via evaporation. In this work, we examine how control over the gas phase drying conditions and initial aerosol droplet composition can be used to influence the aerosol droplet drying kinetics in the gas phase for a range of Péclet numbers. We demonstrate that, for aerosol droplets with initially low feed colloid concentrations and within the constant evaporation regime, the starting composition does not strongly influence the solvent evaporation rate with the initial included nanoparticles (NPs) acting as spectators. However, the gas phase drying conditions, temperature, and relative humidity, directly influence the droplet drying kinetics and the final dry microparticle properties. With a priori knowledge of the droplet drying kinetics from the single droplet measurements, we further demonstrate the possibility of tailoring the morphology of the dried microparticles. Our results extend the fundamental understanding of the mechanisms controlling the drying of aerosol droplets in colloidal suspensions mostly encountered in spray drying applications in the gas phase.

Grant: Enabling rapid liquid and freeze-dried formulation design for the manufacture and delivery of novel biopharmaceuticals

PIs: Dr Robin Curtis, The University of Manchester & Professor Paul Dalby, University College London

11:45-12:15 – Oral Presentation:

Enabling rapid liquid and freeze-dried formulation design for the manufacture and delivery of novel biopharmaceuticals.

Prof Paul Darby, University College London.

Abstract: Protein stability is a critical factor for the successful development of non-aggregating biopharmaceuticals and enzymes. Routes to predictably engineer protein stability are therefore crucial. We have combined a wide range of biophysical analyses, protein engineering, formulation screening, and molecular modelling approaches, to characterise some of the many factors that influence protein aggregation. The increased understanding gained is now also being used to develop improved protein engineering and formulation design strategies for the minimisation of aggregation in liquid and freeze-dried forms.

Poster Presentations:

Supercharging proteins with small polyvalent anions offset aggregation.

Jordan W. Bye, Kiah Murray and Robin A. Curtis

**Grant: INFORM 2020 - Molecules to Manufacture: Processing and Formulation
Engineering of Inhalable Nanoaggregates and Microparticles**

PI: Professor Darragh Murnane, University of Hertfordshire

14:30-15:00 – Oral Presentation:

INFORM 2020: Deconstructing the Role of Powder Agglomerates in Inhaled Powders.

Professor Darragh Murnane, University of Hertfordshire.

Abstract: The state of aggregation of the active pharmaceutical ingredients (APIs) and excipients within inhaled formulations has long been known to direct the success of powder processing as well as product performance. The challenges posed for successful formulation development and manufacture are significant. Small quantities of high surface energy, micron-sized particles have a disproportionate influence on powder behaviour. Material processing frequently induces solid state and formulation instabilities which render reproducible manufacture and aerosolization performance difficult to achieve. INFORM 2020 has sought to address the challenges of inhalation formulations by developing predictive models of formulation behaviour, manufacturing processes and aerosolization events through a variety of crystal, particle, and powder modelling approaches informed by emerging, analytical techniques that probe surface and powder microstructure.

Poster Presentations:

On measuring the specific surface area of inhalation-grade lactose powders.

Dr Ioanni Danal Styliari, University of Hertfordshire

Experimental and numerical analysis of the flow properties of different lactose grades.

Xizhong Chen, University of Cambridge

A digital approach from crystallographic structure to particle attributes for predicting the formulation properties of inhalation pharmaceuticals.

Hien Nguyen, University of Leeds

Molecular modelling metered dose inhaler suspension formulations.

Vivian Walter Barron, University of Leeds

X-ray microscopy for inhalation formulations.

Parmesh Gajjar, University of Manchester.

Abstract: The advent of x-ray optics has allowed higher resolution and improved contrast on laboratory x-ray computed tomography machines. In particular, this has allowed us to examine the microstructure of (dry powder) inhalation formulations in the INFORM2020 project. This poster presents a summary of work including characterisation of carrier lactose, intra-agglomerate quantitative analysis for micronised lactose and examination of drug-carrier blends.

Grant: Formulation for 3D printing: Creating a plug and play platform for a disruptive UK industry

PI: Professor Ricky Wildman, University of Nottingham

15:00-15:30 – Oral Presentation:

Formulation for 3D printing.

Prof Ricky Wildman, University of Nottingham.

Abstract: We will show how we can tackle materials synthesis, formulation and selection in a systematic way such that we can create libraries of materials with known functionalities ready for use in a range of industrial sectors. A number of different levers to being able to control function will be illustrated. This will include varying the geometry, the material, the distribution of material and the microstructure. I will also show how we can describe the development of properties computational such that we can create a design tool that will inform both the composition and the curing strategy that should be employed to achieve the outcome that we desire.

Poster Presentations:

A 3D printed polymeric drug-eluting implant.

Athina Liaskoni, University of Nottingham.

Abstract: Conventional drug delivery systems, tablets, capsules and solutions can be limited for the treatment of some diseases. Their necessary frequent administration can be unpleasant to patients and their compliance can be reduced. Implants, and personalized implants in particular can offer a solution and 3D printing is a novel method of manufacture of such systems. This study aims to investigate the 3D printing of personalisable lidocaine loaded polycaprolactone implants using an extrusion-based 3D printer. In this approach, patients will only need one drug delivery systems which will contain the exact dosages of the active ingredients they need. During the printing, different settings have been applied for the fabrication of the drug loaded polymeric implants following optimisation for the used materials. Physical and chemical characterisation before and after 3D printing were carried out to investigate potential changes in material properties. The drug release rate of the differently printed formulations has been evaluated. It has been shown that the manufacture of drug loaded polycaprolactone implants using a solvent-free method, without the addition of any excipients and at relatively low printing temperature with an extrusion-based 3D printer is feasible. Therefore, this 3D printing method represents a promising technology for the production of personalisable drug-eluting implants.

Formulation for 3D printing: Creating a plug and play platform for a disruptive UK industry.

Marica Malenica, University of Nottingham.

Grant: Complex ORAL health products (CORAL): Characterisation, modelling and manufacturing challenges

PI: Professor Panagiota Angeli, University College London

15:30-16:00 – Oral Presentation:

CORAL - Viscoelastic effects during processing of complex fluids.

Panagiota Angeli, Tom Lacassagne*, Giovanni Meridiano*, Stavroula Balabani, Luca Mazzei
University College London.*

Abstract: We will present an overview of recent developments relevant to the manufacturing of complex fluid formulations. In particular we will focus on two aspects.

We will first discuss the flows of polymer solutions in a Taylor-Couette device, an ideal geometry yet relevant to viscometric properties of the complex fluids. It is found that fluid elasticity promotes elasto-inertial chaos, whereas shear thinning delays or suppresses it - inducing a "Newtonian like" behaviour. This may have important consequences on mixing of such fluids. Neutrally buoyant particles are then suspended in the polymeric liquids, and the combined effects of particles and non-Newtonian solvent properties on the flow transitions are investigated.

We will further present developments on the mixing of solid particles in viscoelastic fluids in a stirred vessel. A combination of laser based technique have been used to measure the velocity fields of the solid and fluid phases simultaneously along with the distribution of the solids in the tank. The experimental data show that in a Newtonian fluid particles disperse uniformly in the vessel, while in a viscoelastic fluid they tend to accumulate in the core of the vortices formed in the flow domain. The clustering, which affects the quality of the mixing, has been attributed to the viscoelasticity-induced cross-flow migration phenomenon and is linked to the viscoelastic property of the fluid.

Future Formulation IV: Delegates

We are delighted to attract so many delegates to our first online meeting (243).

Names and affiliations for those that agreed on registration are below (201).

| Name | Affiliation |
|------------------------------|---|
| Miss Natalie Agyemang | Synthomer |
| Mr Tim Akerman | Tamarind Tree Consulting Ltd |
| Mr Abbass Ali | Cinnabar Green Limited |
| Dr Rohaya Ali | Department of Biochemistry, University of Kashmir |
| Miss Ayah Alkhatib | None |
| Dr Arasavelli Ananda Mohan | Dr. B. R. Ambedkar University, Srikakulam |
| Dr Jessica Andrews | CPI |
| Dr Sarada Anepu | AU College of Pharmaceutical Sciences |
| Professor Panagiota Angeli | Department of Chemical Engineering, UCL |
| Dr Samir Aoudjane | UCL |
| Dr Prafulla Apshingekar | Recipharm Limited |
| Dr Justice Archer | University of Bristol |
| Mr Akshai Ashok Kumar | University of Leeds |
| Ms Sherry Backman | Green Mountain Cosmetics |
| Dr Géraldine Baekelandt | Oxford HighQ |
| Miss Emily Bagguley | Cranfield University |
| Professor Stavroula Balabani | UCL |
| Mr Vivian Barron | University of Leeds |
| Professor Andrew Bayly | University of Leeds |
| Dr Patricia Blanco-Garcia | JohnsonMatthey |
| Dr James Bowen | Open University |
| Dr Samuel Bradberry | Private Interest |
| Mrs Veronique Bradbury | CPL Aromas |
| Mr Joe Bradley | University of Edinburgh |
| Mr Brendan Brady | University of Reading |
| Dr Liam Brennan | STFC |
| Mr Mark Brewer | Shell Research |
| Mr Smuel Brown | Edinburgh University |
| Mr Hubert Buksa | The University of Sheffield |
| Dr Jim Bullock | iFormulate Ltd |
| Mr Paul Butler | Advanced Instruments |
| Dr Jordan Bye | University of Manchester |
| Dr David Calvert | iFormulate Limited |
| Dr Beatrice Cattoz | Infineum UK Ltd |
| Mrs Ana Cenacchi | Total MS |
| Dr Xizhong Chen | University of Cambridge |
| Dr Przemysław Chwała | MAPEI Poland |

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| Name | Affiliation |
|---------------------------------|---|
| Dr Charles Clifford | National Physical Laboratory |
| Mr Peter Collins | Peter Collins Coatings Consultancy Ltd |
| Mrs Laura Coward | Town Talk Polish Co Ltd |
| Dr Anna Croft | University of Nottingham |
| Dr Graeme Cruickshank | Centre for Process Innovation Ltd |
| Mr John Cummins | Wolfson Centre, University of Greenwich |
| Miss Grace Cunningham | University of Birmingham |
| Dr David Curry | Altair Engineering Ltd (formerly DEM Solutions) |
| Dr Robin Curtis | university of manchester |
| Professor Paul Dalby | University College London |
| Professor Ruslan Davidchack | University of Leicester |
| Dr Alexander de Bruin | Johnson Matthey |
| Ms Elienai Del Razo Olvera | Chemistry Faculty |
| Dr Licia Dossi | Cranfield University |
| Dr David Doughty | Hallidex Ltd |
| Dr Nicholas Dunwoody | Tetraphase Pharmaceuticals, Inc |
| Professor Karen Edler | University of Bath |
| Dr Ben Edmans | University of Leicester |
| Dr Martin Edwards | Britest |
| Professor James Elliott | University of Cambridge |
| Mr William Ewbank | Ajinomoto OmniChem |
| Ms Paula A Feldman MRSB | Royal Society of Chemistry |
| Mr Joao Filipe Ferreira Ascenso | Nerudia |
| Dr Rachel Findlay | CPI |
| Dr Nathan Flood | Health and Safety Executive |
| Professor Leonardo Fraceto | Unesp |
| Dr William Frith | Unilever |
| Dr Parmesh Gajjar | The University of Manchester |
| Dr Pablo Garcia Trinanés | University of Greenwich |
| Dr Esther Garcia-Tunon | Materials Innovation Factory and School of Engineering, University of Liverpool |
| Mr Vivek Garg | University of Greenwich |
| Dr Patricia Geelen | CoPo Solutions |
| Dr Paul Gellert | AstraZeneca |
| Mr Amir Ghayour | BASF |
| Professor Simon Gibbon | AkzoNobel R&D |
| Dr Matthew Giles | Innospec Ltd |
| Dr Philip Gill | Cranfield University |
| Dr Jurriaan Gillissen | UCL |
| Professor David Goodall | Paraytec Ltd |
| Dr Peter Gould | QinetiQ |
| Mrs Vivienne Gray | Bristol Myers Squibb |
| Dr Richard Greenwood | University of Birmingham |

Future Formulation IV – Virtual Meeting – 23 June 2020

| Name | Affiliation |
|-------------------------------------|---|
| Miss Encina Gutierrez Carazo | Cranfield University |
| Mr Dan Hardy | University of Bristol |
| Dr Alan Harris | Cipla |
| Mr Ian Harrison | Alchemy Pharmatech |
| Dr Fiona Hatton | Loughborough University |
| Professor Dr Jamie Hawkes | UNIFAL-MG |
| Dr Yinfeng He | University of Nottingham |
| Dr Jerry Heng | Imperial College London |
| Dr Alain Hill | Worlée |
| Dr John Hone | Syngenta |
| Dr Jennifer Hooton | Novartis |
| Dr Lisa Humphreys | Cranfield University |
| Dr Elizabeth Jamie | Schlumberger Cambridge Research |
| Professor Stephan Jefferis | Environmental Geotechnics Ltd |
| Dr Gareth Jeffrey | GSK |
| Dr Paul Jenkins | Unilever Research & Development |
| Dr Xiaodong Jia | University of Leeds |
| Mr Stephen Jones | Nerudia |
| Dr Vikram Karde | Imperial College London |
| Dr Caroline Kelly | CPI |
| Miss Eva Kingwood | University of Nottingham |
| Dr Paul Kippax | Malvern Panalytical |
| Dr Paul Kirkman | Lubrizol Ltd. |
| Dr Dimitrios Kontziampasis | University of Cumbria |
| Dr Nick Koumakis | University of Edinburgh |
| Dr Tomasz Kubczyk | Animax Ltd |
| Miss Joyce Kwok | University of Oxford |
| Dr Stephen Lacy | Albert Browne Ltd, STERIS Corporation |
| Dr Nathalie Letzelter | P&G |
| Professor Mingzhong Li | De Montfort University |
| Miss Athina Liaskoni | University of Nottingham |
| Dr Sergio Luis Lima de Moraes Ramos | University of Manchester |
| Mr Soichiro Makino | University of Edinburgh |
| Ms Marica Malenica | University of Nottingham |
| Professor Heidi Mansour | The University of Arizona Colleges of Pharmacy & Medicine |
| Dr Ioannis Marinopoulos | Walgreens Boots Alliance |
| Dr Paul Matejtschuk | NIBSC |
| Dr Steven Maxwell-Hogg | Nerudia |
| Dr Simson McCreath | University of Strathclyde |
| Mr Lewis McHale | University of Edinburgh |
| Dr Mansur Mohammadi | Biruni Associates (ex Unilever R&D) |
| Dr James Mulligan | Self |

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| Name | Affiliation |
|--------------------------------|---------------------------------------|
| Professor Darragh Murnane | University of Hertfordshire |
| Dr Chiluba Mwila | University of Zambia |
| Dr Graham Myatt | Cambridge Design Partnership |
| Miss Jihane Mzoughi | CNRS IS2M UMR7361 |
| Mr Sandeep Nair | not working |
| Dr Christopher Ness | University of Edinburgh |
| Dr Jude Isioma Ngadaonye | Kora Healthcare |
| Dr Hien Nguyen | University of Leeds |
| Miss Mary Odiji | Ohenmerge company LTD |
| Dr Zhan Yuin Ong | University of Leeds |
| Dr Aloysius Ononye | University of Cincinnati - Ohio |
| Mr Paul Osborne | Clinigen Group plc |
| Mr Raj Pal | Kps college of education |
| Mr David Palmer | Micropore Technologies Ltd |
| Dr Ananth Pannala | University of Brighton |
| Miss Anastasia Papadopoulou | UCL/Mechanical Engineering |
| Dr Massih Pasha | Chemours |
| Professor Siddharth Patwardhan | University of Sheffield |
| Miss Lauren Payne | Synthomer |
| Mr Samuel Peel | International Flavors and Fragrances |
| Mr Ben Pellegrini | Intellegens |
| Dr Nick Penfold | Syngenta |
| Dr Matthew Powell | Prenwell Consulting Limited |
| Mrs Janine Preston | University of Leeds |
| Professor Vivek Ranade | Queen's University Belfast |
| Mr Pietro Rando | University of Surrey |
| Dr Mikael Rasmusson | Consultant |
| Professor Jonathan Reid | University of Bristol |
| Mrs Haixia Ren | Astrazeneca.com |
| Mr Marc Olivier Reula | Lycée Pierre-Gilles de Gennes - ENCPB |
| Dr Gavin Reynolds | AstraZeneca |
| Dr Debbie Roberts | N/A |
| Mr Neil Robertson | Abbey Ecosse |
| Dr Deeleep Rout | Almora Botanica |
| Mrs Claire Rowland | Givaudan UK |
| Dr John Royer | The University of Edinburgh |
| Mr Matthew Royle | Durham University |
| Dr Helen Ryder | The University of Manchester |
| Dr Hamid Salehi | University of Greenwich |
| Ms Sara Salimi | University of Reading |
| Miss Lena Sambe | Synthomer |
| Dr Manuel Sanchez-Felix | Novartis |

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| Name | Affiliation |
|---------------------------------|--|
| Mrs Nektaria Servi | Surface Measurement Systems |
| Dr Poonam Sharma | Recochem Inc. |
| Dr William Sharratt | Imperial College |
| Mr Martin Shaw | Croda |
| Dr Katie Shelbourne | Angus International |
| Dr Jing Shi | Durham University |
| Professor Dr Prashant Shukla | Amity University Uttar Pradesh Lucknow |
| Dr Elena Simone | University of Leeds |
| Dr Flor Siperstein | University of Manchester |
| Mr Andrew Stacey | Avgo Biotech |
| Mr Danny Stam | Technobis |
| Dr Ev Stöckel | Nerudia |
| Dr Ioanna Danai Styliari | University of Hertfordshire |
| Dr Jin Sun | University of Edinburgh |
| Mr Paul Swift | Procter & Gamble |
| Mr Hossam Tantawy | Procter & Gamble Newcastle Innovation Centre |
| Dr Mark Taylor | CPI |
| Dr Fideline Tchuenbou-Magaia | University of Wolverhampton |
| Dr Maya Thanou | King's College London |
| Professor Phil Threlfall-Holmes | TH Collaborative Innovation |
| Mr Yongqiang Tu | University de Lorraine |
| Mr Anand Vadesa | De Montfort University |
| Dr Kelli Vandera | King's College London |
| Dr Ramesh Vemula | Recochem Inc. |
| Dr Shyam Vyas | International Flavors and Fragrance |
| Dr Alison Wagland | Johnson Matthey Technology Centre |
| Mr Alex Warren | ColorMatrix |
| Dr Jim Warwicker | University of Manchester |
| Dr Madeleine Watson | Imperial College London |
| Mr Darren Whitworth | GlaxoSmithKline |
| Professor Ricky Wildman | University of Nottingham |
| Ms Stephanie Williams | EPSRC |
| Dr Lisong Yang | Durham University |
| Mr Naveen Yaragudi | Teva |
| Mr Koray Yıldırım | Toyook |
| Dr Umair Zafar | Novartis |
| Dr Cheng Zhang | UCL |
| Dr Jason Zhang | University of Birmingham |

Upcoming Events for 2020 and beyond:

In line with guidance from the Royal Society of Chemistry we have postponed all face-to-face events. Looking forward to the future we plan to offer both face-to-face and online events.

2020 Events:

Formulation 4.1 – Online – summer 2020 (date TBC) – This will be the second chapter of the story of bringing digital to all aspect of formulation – helen.ryder@formulation.org.uk
Read all about [Formulation 4.0 here](#)

Formative Formulation 2 – date TBC – University of Edinburgh

A follow-up conference to [Formative Formulation](#), this is a technical meeting for early career formulation scientists in industry and academia

2021 Events:

Keeping it Green in Personal Care – 2 March 2021 – Burlington House, London

Advances in Corrosion Protection by Organic Coatings (ACPOC7) – 5-9 September 2021 – University of Cambridge

MIBio2021 – date TBC – University of Cambridge

The MIBio conference series showcases how formulation is a critical and integral part of the biopharmaceutical development process. This will be the tenth event in the series. Previous years can be viewed online ([2019 link here](#)).

Future events:

The RSC-FST Interest Group is currently planning formulation conferences in the following areas:

- Powder Flow
- Formulation Modelling/Automated Formulation
- Formulation Monitoring (defence barriers)
- Renewable Materials
- Formulation Science Fair (Outreach)

We would love to hear from you if you have an idea for a new RSC-FST meeting and/or if you would like to help with the organisation of an event.