



CPAC Rome Workshop 2022
University of Washington Rome Center
Piazza del Biscione, 95, Rome Italy

March 21-23, 2022

Utilization of New Processing Concepts to Support the Demand for Sustainable Materials in a Circular Economy, often enabled by Exploring New Reaction Routes for Continuous Flow Processing Aided by Real-Time Monitoring Technology

Rome Workshop Organizers: Ray Chrisman and Mel Koch, Center for Process Analysis and Control (CPAC)/Applied Physics Laboratory (APL), University of Washington, Norse Biotech, and MK Optimization and Control LLC

Rome Workshop Advisory Steering Committee: Giancarlo Cravotto, U Turin; Claude De Bellefon, U Lyon; Ludo Diels, VITO; Frank Gupton, Virginia Commonwealth University, Volker Hessel, Adelaide U; Simone Maccagnan, Gimac Microextruders; Brian Marquardt, CPAC/U Washington and MarqMetrix, Peter Poechlauer, Thermo Fisher Scientific; Kurt VandenBussche, Honeywell UOP; Paul Watts, Nelson Mandela U

Sponsorship

Bruker, Optimal Industrial Technologies Ltd., Rollo Agro Enterprises, Tertracore, Virginia Commonwealth University

Note: Time is shown as GMT +1

Monday, March 21, 2022

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| 8:00 | Registration Opens Floor 1, Grand Conference Room, UWRC, Piazza del Biscione 95 |
| 9:15-9:30 | Welcome and Introduction Mel Koch, CPAC, Norse Biotech and MK Optimization and Control, USA |

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| 9:30-9:45 | Welcome to University of Washington Rome Center (UWRC) Amity Neumeister, UWRC Resident Director, Italy |
| Concept One | The Challenge of the Circular Economy |
| 9:45-10:15 | The Circular Economy, Hard Problems and a Bonanza of Possibilities for Advanced Engineering Harald Sverdrup, Inland University of Applied Sciences and Norse Metal, Norway |
| 10:15-10:45 | See, Think, Act, and Socialize: the Role of Sensing in Autonomous Plant Operations Kurt VandenBussche, Honeywell AeroSpace Corporate Technology, USA |
| 10:45-11:00 | Break |
| Concept Two | Examples of New Concept to Facilitate Next Generation Processes |
| 11:00-11:25 | Circularity and Sustainability Quantified for 'Green Solvents' and 'Green Synthesis Strategies' in Flow Volker Hessel, University of Adelaide, Australia |
| 11:25-11:50 | Green Shades in Organic Synthesis Luigi Vaccaro, University of Perugia, Italy |
| 11:50-12:15 | The Role of Biomass in a Circular Economy Ludo Diels, VITO, Belgium Ludo Diels, VITO, Belgium |
| 12:15-14:00 | Lunch |
| Concept Three | Enabling Process Understanding to Enable the Integration of Multiple Unit Operations for Continuous Processing |
| 14:00-14:25 | From Mechanochemistry to Reactive Extruders, a Greener Approach to Organic Synthesis Giancarlo Cravotto, University of Turin, and Simone Maccagnan, Gimac, Italy |
| 14:25-14:50 | Continuous Flow Photochemistry for the Sustainable Synthesis of Drug-Like Entities Marcus Baumann, University College Dublin, Ireland |
| Concept Four | Continuous Production for the Efficient Production of Complex Molecules |
| 14:50-15:15 | Ensuring Access to Medicines in a Post-Pandemic World Frank Gupton, Virginia Commonwealth University, USA |
| 15:15-15:30 | Break |

15:30-15:55 **Greening the Synthesis of Blocked Polyisocyanates: Developing a Continuous Process Using Real-Time PAT**
C. Oliver Kappe, University of Graz and Research Center for Pharmaceutical Engineering GmbH (RCPE), Austria

**Concept
Seven** **Advances in Process Unit Operations**

15:55-16:20 **Using Integrated Instrumentation and Data Fusion to Deliver More Sustainable Manufacturing with Improved quality and reduced Giveaway**
Martin Gadsby, Optimal Industrial Technologies Ltd., UK

16:20-16:45 **Fiber Spectroscopy Tools to Use in PAT Applications**
Viacheslav Artyushenko, Art Photonics, Germany

16:45-17:15 **An Analogy between Traditional Process Optimization and Personalized Medicine**
Tunde Ogunnaike, University of Delaware, USA, and Ray Chrisman, Norse Biotech and MK Optimization and Control, USA

17:15-17:45 **Discussion**
Ray Chrisman, Norse Biotech and MK Optimization and Control, USA

17:45 **con Apertivo**
UWRC Seminar Room and Balcony

Tuesday, March 22, 2022

9:00-9:10 **Introduction**
Mel Koch, CPAC, Norse Biotech and MK Optimization and Control

**Concept
One** **The Challenge of the Circular Economy**

9:10-9:40 **Process Intensification Combined with new Options for Process Control**
Peter Poechlauer, Patheon, Thermo Fisher Scientific, Austria

9:40-10:05 **Leveraging Design Space Flexibility to Deliver Process Optimization**
Martin Warman, Martin Warman Consultancy, UK

**Concept
Two** **Examples of New Concept to Facilitate Next Generation Processes**

10:05-10:30 **Developing Smart Sensors for the Food Industry**
Jens Petter Wold, Norwegian Food Research Institute (NOFIMA), Norway

10:30-10:45 **Break**

10:45-11:10 **Topics Related to De-Polymerization of Lignin into Chemicals**
Bernd Wittgens, SINTEF Industry, Norway

Concept Four Continuous Production for the Efficient Production of Complex Molecules

11:10-11:35 **Process Optimization of Drugs Utilizing Continuous Flow Approaches**
Paul Watts, Nelson Mandela University, South Africa

11:35-12:00 **Rapid Optimization of Pharmaceutical Processes Using Automated Systems**
Frans Muller and Richard Bourne, University of Leeds, UK

12:00-12:25 Transfer to Lunch location

12:25-14:00 Lunch

Concept Five Process Automation of Coupled Multiple Unit Operations for Continuous Processing

14:00-14:25 **The Broader Challenges for Automation and Control of Multiple Step Processes**
Andrew Rutter, Rutter Design, UK

14:25-14:50 **Flow Chemistry to Understand C-C Coupling Reactions at PPB Levels of Catalyst**
Claude de Bellefon, University of Lyon, France

Concept Six Bio-Based Projects to Pursue a Circular Economy

14:50-15:15 **Biosourced Building Blocks for the Preparation of Innovative Materials**
Maurizio Galimberti, Polytechnic University of Milan, Italy

15:15-15:30 Break

15:30-15:55 **New Cost Effective Routes for Feedstocks from Biomass**
Ray Chrisman, Norse Biotech and MK Optimization and Control, USA

Concept Eight Solution Providers

15:55-16:20 **Improving Process Efficiency using In-Process Control**
Uwe Kirschner, Sentronic, Germany

16:20-16:45 **Advances in Microreactors**
Alessandra Vizza, Corning, France

16:45-17:10 **Process Raman in Biopharma**
Brian Marquardt, MarqMetrix, USA

17:10-17:30 **Discussion**
Ray Chrisman, Norse Biotech and MK Optimization and Control, USA

17:45 **con Apertivo**
UWRC Seminar Room and Balcony

Wednesday, March 23, 2022

9:00-9:10 **Introduction**
Mel Koch, CPAC, Norse Biotech and MK Optimization and Control

Concept One **The Challenge of the Circular Economy**

9:10-9:40 **The Use of NMR in an Integrated PAT Environment to Increase Process Understanding and Efficiency, Towards Circular Economy**
Anna Codina, Bruker BioSpin, UK

9:35-10:00 **How Knowledge is Exchanged in Transnational Innovation Networks – With a Focus on the European Union Nanotechnology Network**
Giuseppe Calignano, Inland University of Applied Sciences, Norway

Concept Seven **Advances in Process Unit Operations**

10:00-10:25 **Can In Vitro Organ-on-a-Chip (OoC) Technologies Contribute to the Circular Pharmaceutical Supply Chain by Waste Reduction?**
Vita Guarino, E. Perrone, A. Zizzari, M. Bianco G. Gigli, L. Moroni, V. Arima, CNR Nanotec, Italy

10:25-10:40 **Break**

10:40-11:05 **Methodologies for Modular Plants**
Marco Banti, Automation and Digital Transition Advisor, Pharma & Fine Chemicals Industries, Italy

11:05-11:30 **ANALYSIS, the Link between Suppliers of Innovative Technologies and Industrial End-Users**
Franck Baco Antoniali, Axel'One, France

11:30-11:55 **Developing and Applying Gas Chromatography with Chemometrics to Enable Discovery-Based Chemical Analysis**
Caitlin Cain and Robert E. Synovec, University of Washington, USA

11:55-14:00 **Lunch**

Concept Eight **Solution Providers**

14:00-14:25 **FTIR Spectroscopy as a Future Bioprocess Monitoring Tool – With Some Examples from Enzymatic Protein Hydrolysis**
Nils Kristian Afseth, Norwegian Food Research Institute (NOFIMA), Norway

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| 14:25-14:50 | Transmission Raman Spectroscopy (TMS) Applied as a Replacement for the Heavy Load of LC Analyses of our UOC/UOB Products Yousif Ayoub, Bianca Avramovitch, Teva Pharmaceuticals, Israel |
| 14:50-15:15 | Advances in Characterizing Flow with Magnetic Resonance Technology Matt Augustine, University of California, Davis, USA |
| 15:15-15:30 | Break |
| 15:30-15:55 | Technological Advances Providing Higher Quality Information for PAT Process Understanding Leading to Greater Knowledge and Management for Continuous Manufacturing Ernie Hillier, Hillier Consults, USA |
| 15:55-16:20 | Optical Identification of Bacterial Strains to Facilitate Kirby Bauer AST Analysis William Nelson, Tetracore, USA |
| 16:20-16:45 | Online HPLC for Continuous Reaction Monitoring in cGMP Manufacturing Marty Johnson, Eli Lilly and Company, USA |
| 16:45-17:10 | Discussion and Conclusion of Meeting Ray Chrisman, Norse Biotech and MK Optimization and Control, USA |
| 17:10 | con Apertivo UWRC Seminar Room and Balcony |
