



CPAC Rome Workshop 2023
University of Washington Rome Center
Piazza del Biscione, 95, Rome Italy

March 20-22, 2023

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

Axel'One, Bruker BioSpin, Optimal Industrial Technologies Ltd., Rollo Agro Enterprises, Tekno Scienze, Tertracore, Virginia Commonwealth University

Concepts (Sections of the Program)

1. The Challenge of the Circular Economy
2. Examples of New Concept to Facilitate Next Generation Processes
3. Enabling Process Understanding to Enable the Integration of Multiple Unit Operations for Continuous Processing
4. Continuous Production for the Efficient Production of Complex Molecules
5. Achieving a Sustainable Bio-refinery

6. Advances in Process Unit Operations
7. Process Automation of Coupled Multiple Unit Operations for Continuous Processing
8. Solution Providers (Advances in Measurement Science and Data Handling)

Note: Time is shown as GMT +1

Monday, March 20, 2023

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
9:30-9:45	Welcome to University of Washington Rome Center (UWRC) Amity Neumeister, UWRC Resident Director, Italy
The Challenge of the Circular Economy	
9:45-10:15	The Role of Innovative Engineering, Systems Thinking and New Unit Operations in the Circular Economy Harald Sverdrup, Inland University of Applied Sciences and Norse Metal, Norway
10:15-10:45	To Facilitate a Rapid Transition to a Circular bioeconomy will Require the Development of New Tools to Speed Process Development Ray Chrisman, Norse Biotech and MK Optimization and Control, USA
10:45-11:00	Break
Examples of New Concept to Facilitate Next Generation Processes	
11:00-11:25	Flow Synthesis of Phosphorus Composites for Enhancing P Availability in Soil Volker Hessel, University of Adelaide, Australia
11:25-11:50	Circularity and Green Chemistry: From Catalyst Design to Clean Hydrogen and Molecular Targets Luigi Vaccaro, University of Perugia, Italy
11:50-12:15	Circular Economy Hand in Hand with Climate Neutrality Ludo Diels, VITO, Belgium Ludo Diels, VITO, Belgium
12:15-14:00	Lunch
Enabling Process Understanding to Enable the Integration of Multiple Unit Operations for Continuous Processing	
14:00-14:25	Hemp as a Booster of Circular Economy: New Technologies and Processes Giancarlo Cravotto, University of Turin, Italy

14:25-14:50 **Flow Photochemistry as a Greener Approach for the Synthesis of Drugs and Drug-Like Scaffolds**
Marcus Baumann, University College Dublin, Ireland

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 **Flow Electro-Organic Synthesis for Sustainable and Efficient API Manufacturing**
C. Oliver Kappe, University of Graz and Research Center for Pharmaceutical Engineering GmbH (RCPE), Austria

Advances in Process Unit Operations

15:55-16:20 **The Application of PAT and Advanced Instrumentation to Support R&D, Manufacturing and the Circular Economy**
Martin Gadsby, Optimal Industrial Technologies Ltd., UK

16:20-16:45 **Fiber Spectroscopy Solutions for Remote Process-Control *in-line***
Viacheslav Artyushenko, Art Photonics, Germany

16:45-17:15 **Discussion**
Ray Chrisman, Norse Biotech and MK Optimization and Control, USA

17:15 **con Apertivo**
UWRC Seminar Room and Balcony

Tuesday, March 21, 2023

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

The Challenge of the Circular Economy

9:10-9:40 **To be announced**

9:40-10:05 **Realizing the Full Potential of Continuous Manufacturing in the Pharmaceutical Innovator Space**
Martin Warman, Martin Warman Consultancy, UK

Examples of New Concepts to Facilitate Next Generation Processes

10:05-10:30 **Developing Smart Sensors for the Food Industry**
Nils Kristian Afseth, Norwegian Institute of Food, Fisheries and Aquaculture
Research (NOFIMA), Norway

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

10:45-11:10 **Zero-Emission Aviation - Pipedream or an achievable target ?**
Kurt VandenBussche, Honeywell AeroSpace Corporate Technology, USA

Continuous Production for the Efficient Production of Complex Molecules

11:10-11:35 **Continuous Flow API Synthesis to Enable Local Manufacturing**
Paul Watts, Nelson Mandela University, South Africa

11:35-12:00 **Optical Identification of Bacterial Strains to Facilitate Kirby Bauer AST
Analysis**
William Nelson, Tetracore, USA

12:00-12:15 Transfer to Lunch location, ground floor of Palazzo Pio

12:15-14:00 **Lunch in Da Pancrazio (located in the ancient gallery of Theater of Pompey)**

Process Automation of Coupled Multiple Unit Operations for Continuous Processing

14:00-14:25 **The Future Scale and Mode of Manufacture for the Sustainable Supply of
Medicines**
Andrew Rutter, Rutter Design, UK

14:25-14:50 **TBC**
Claude de Bellefon, University of Lyon, France

Bio-Based Projects to Pursue a Circular Economy

14:50-15:15 **Circular Materials from Proteins**
Maurizio Galimberti, Vincenzina Barbera Polytechnico Milano, Milan, Italy

15:15-15:30 **Break**

Solution Providers

15:30-15:55 **Towards Implementing NMR in Challenging, Process Environments**
Matt Augustine, University of California, Davis, USA

15:55-16:20 **Adducts of sp² Carbon Atoms Functionalized with Pyrrole Compounds with Transition Metal atoms: Towards Single Atom Catalysis**

Vincenzina Barbera, Maurizio Galimberti, Polytechnico Milano, Milan, Italy

16:20-16:45 **Chemical Upcycling of Plastics and the Development of "Infinitely Recyclable" Polymer Materials, as Studied by In Situ NMR/MRI**

Sophia Fricke, University of California at Berkeley, USA

16:45-17:10 **Process Raman**

Brian Marquardt, MarqMetrix, USA

17:10-17:30 **TBA**

17:45 **con Apertivo**

UWRC Seminar Room and Balcony

Wednesday, March 22, 2023

9:00-9:10 **Introduction**

Mel Koch, CPAC, Norse Biotech and MK Optimization and Control

The Challenge of the Circular Economy

9:10-9:40 **Latest Advances on the Applications of Flow NMR and IR to (bio)PAT**

Vincenzo Fusillo and Anna Codina, Bruker BioSpin, Germany and 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

Advances in Process Unit Operations

10:00-10:25 **Microfluidic Production of Lipid-based Nanovesicles for Imaging and Drug Delivery**

Valentina Arima, Alessandra Zizzari, Monica Bianco, Luigi Carbone, Elisabetta Perrone, CNR Nanotec, Italy

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

10:40-11:05 **Modular Automation Approaches for New Generation's Modular Plants**

Marco Banti, Automation and Digital Transition Advisor, Pharma & Fine Chemicals Industries, Italy

11:05-11:30 **Optimization of Processes Using Online Analysis and Digital Chains (Data Fusion and Artificial Intelligence)**

Franck Baco Antoniali and Manis Ghéghiani, Axel'One, France

11:30-11:55 **Monitoring and Adjusting a Batch Process Using Online Raman Sensors and Multivariate Modelling**

Olav Kvalheim, University of Bergen, Norway

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

Solution Providers

14:00-14:25 **Technological Advances Providing Higher Quality Information for PAT Process Understanding Leading to Greater Knowledge and Management for Continuous Manufacturing**
Ernie Hillier, Hillier Consults, USA

14:25-14:50 **New Cost Effective Routes for Feedstocks from Biomass**
Ray Chrisman, Norse Biotech and MK Optimization and Control, USA

14:50-15:15 **Characterizing Solvent Composition in a CO₂ Capture Plant Using Multivariate Data Analysis of Online Sensors and Spectroscopic Data**
Bjørn Grung, University of Bergen, Norway

15:15-15:30 **Break**

15:30-15:55 **Continuous Biocatalysis for Upgrading Biowaste**
Amanda Christine Evans, Los Alamos National Laboratory, USA

15:55-16:20 **TBA**

16:20-16:45 **TBA**

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
