euro pact 2017

PROGRAMME

10 – 12 May 2017 · Potsdam · Germany

EuroPACT 2017

4rd European Conference on Process Analytics and Control Technology

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DECHEMA

arbeitskreis prozessanalytik

GDCh

CPACT CENTRE FOR PROCESS ANALYTICS AND CONTROL TECHNOLOGY

APACT

EUFEPS EUROPEAN FEDERATION FOR PHARMACEUTICAL SCIENCES

PAC Process Analytical Chemistry

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CO-ORGANISING GROUPS

ARBEITSKREIS PROZESSANALYTIK – Working Group Process Analytics
CPACT – Centre for Process Analytics and Control Technology
DECHEMA – Society for Chemical Engineering and Biotechnology e.V.
APACT – Advances in Process Analytics and Control Technology
EUFEPS – European Federation for Pharmaceutical Sciences
GDCh – German Chemical Society e.V.
PAC – The Austrian research-network for Process Analytical Chemistry

ORGANISER & CONFERENCE OFFICE

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TABLE OF CONTENTS

SPONSORS

EXHIBITION

PROGRAMME AT A GLANCE

SIEMENS AWARD

LECTURE PROGRAMME

- Tuesday, 9 May 2017
- Wednesday, 10 May 2017
- Thursday, 11 May 2017
- Friday, 12 May 2017

POSTER PROGRAMME

LECTURE ABSTRACTS

POSTER ABSTRACTS

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- 13 **Bilfinger Industrietechnik**
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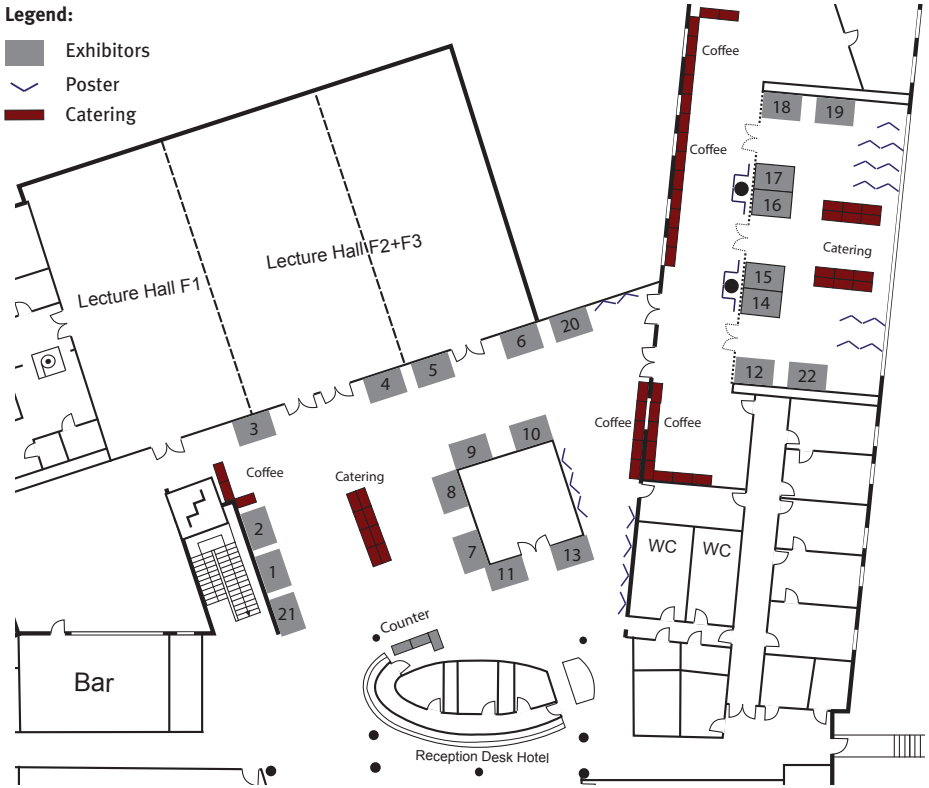

Tuesday, 9 May 2017

12:30 – 17:30	**Pre-Conference Courses** The courses will be offered on-site in different research institutions and universities in Berlin and Potsdam. Please see www.euro-pact.org

Wednesday, 10 May 2017

	Room: F2 + F3	
09:15	**Opening**	
	PLENARY LECTURES	
09:30	Satoru Tsuchikawa, Nagoya University/JP	
10:15	Mary Beth Seasholtz, The Dow Chemical Company, Midland, MI/USA	
11:00	Coffee break	
	Room: F2 + F3	Room: F1
11:30 – 13:00	**1A: PROCESS MONITORING AND CONTROL IN PHARMACEUTICAL INDUSTRY 1** (Solids)	**1B: PROCESS MONITORING AND CONTROL FOR BIOTECHNOLOGY 1**
13:00 – 14:00	Lunch	
	Room: F2 + F3	
	PLENARY LECTURES	
14:00	Walter Broeckx, Procter & Gamble, Strombeek-Bever/B	
14:45	Waltraud Kessler, STZ Prozesskontrolle und Datenanalyse, Reutlingen/D	
15:30	Coffee break	
	Room: F2 + F3	Room: F1
16:00 – 17:30	**2A: PROCESS MONITORING AND CONTROL IN PHARMACEUTICAL INDUSTRY 2**	**2B: PROCESS MONITORING AND CONTROL FOR BIOTECHNOLOGY 1**
17:30 – 18:00	Poster Short Presentations Session A	Poster Short Presentations Session B
18:00 – 21:00	**Poster Session A+B & Welcome Reception**	

Thursday, 11 May 2017

	Room: F2 + F3	
	PLENARY LECTURES	
08:30	Jose Romagnoli, Louisiana State University/USA	
09:15	M. Pereira Remelhe[1]; F. Muller[2]; [1] Bayer AG, Leverkusen/D; [2] University of Leeds/UK	
10:00	Coffee break	
	Room: F2 + F3	Room: F1
10:30 – 12:00	**5B: MODELLING AND CONTROL TECHNOLOGY**	**3B: PROCESS MONITORING AND CONTROL IN REAL LIFE MANUFACTURING 1**
12:30 – 13:30	Lunch	
13:30 – 14:00	Poster Short Presentations Session C	Poster Short Presentations Session D
14:00	**Poster Session C+D & Coffee break**	
	Room: F2 + F3	Room: F1
16:00 – 18:00	**4A: IMAGE ANALYSIS AND PROCESS TOMOGRAPHY**	**3B: PROCESS MONITORING AND CONTROL IN REAL LIFE MANUFACTURING 2**
19:30	**Conference Dinner at "Kutschstall"** Am Neuen Markt 9A, 14467 Potsdam	

Friday, 12 May 2017

	Room: F2 + F3	
	PLENARY LECTURE	
08:40	Jouko Malinen, VTT Oulu/FIN	
09:25	Cyril Ruckebusch, Technical University of Lille/F	
	Room: F2 + F3	Room: F1
10:15 – 11:15	**3A: PROCESS MONITORING AND CONTROL IN PHARMACEUTICAL INDUSTRY 3** (New technologies)	**5 A: CHEMOMETRICS 1**
11:15	Coffee break	
11:45 – 13:15	**3A: PROCESS MONITORING AND CONTROL IN PHARMACEUTICAL INDUSTRY 4** (New technologies)	**5B: CHEMOMETRICS 2**
	Room: F2 + F3	
13:15	**Closing | Poster Prize | Siemens Prize**	
13:30	Lunch /End of the conference	

SIEMENS AWARD

Siemens Process Analytics Prize for Young Scientists

The German Working Group "Prozessanalytik" in cooperation with Siemens will award the 5th Siemens Process Analytics Prize to a young scientist for an outstanding publication in the field of Process Analytics.

The prize is endowed with € 1.500. A EuroPACT 2017 prize committee will select the winner. The award will be presented during the closing session.

arbeitskreis prozessanalytik SIEMENS

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Tuesday, 9 May 2017

12:30	**Pre-Conference Courses** (12:30 – 17:30) The courses will be offered on-site in different research institutions and universities in Berlin and Potsdam. Please see www.euro-pact.org

Wednesday, 10 May 2017

	Room: F2+F3	
09:15	**Opening**	
	PLENARY LECTURES	
	Chair: D. Littlejohn, University of Strathclyde, CPACT, Glasgow/UK	
09:30	**Status, Limit, and Future of NIR technology as Agricultural Spectroscopy** S. Tsuchikawa, Nagoya University/JP	
10: 15	**Using data to make money in the chemical industry: success stories and challenges** M. B. Seasholtz, The Dow Chemical Company, Midland, MI/ USA	
11:00	Coffee Break	
	Room: F2+F3	Room: F1
	1A: PROCESS MONITORING AND CONTROL IN PHARMACEUTICAL INDUSTRY 1 (Solids)	**1B: PROCESS MONITORING AND CONTROL FOR BIOTECHNOLOGY 1**
	Chair:T. Kourti, International Society for Pharmaceutical Engineering (ISPE), Tampa/USA	*Chair: S. Roussel, Ondalys/F*
11:30	**Application of process analytical technology (PAT) tools for the better understanding and control of crystallisation processes** E. Simone[1]; M. Parada[1]; M. Povey[1]; Z. Nagy[2]; [1] University of Leeds/UK; [2] Purdue University, West Lafayette/USA	**Image analysis as a tool for process monitoring in biotechnology** M. Sandmann[1]; M. Lippold[1]; M. Schafberg[2]; C. Odika[1]; S. Rohn[1]; [1] Institute for Food and Environmental Research, Nuthetal/D; [2] Hamburg School of Food Science, Universität Hamburg/D
12:00	**API lump/agglomerate detection in powder blends by inline NIR** A. Gerich[1]; R. Besseling[1]; M. Damen[1]; [1] InProcess-LSP, Oss/D	**Photo-optical in situ analysis of the single-cell size distribution as analytical tool in microbial bioprocesses.** A. Marba Ardebol[1]; J. Emmerich[2]; P. Neubauer[1]; S. Junne[1]; [1] TU Berlin, Fachgebiet Bioverfahrenstechnik, Berlin/D; [2] SOPAT GmbH, Berlin/D
12:30	**Modelling of particle size and shape distribution in pharmaceutical suspensions and the effects on UV-vis-NIR** D. Stoliarskaia[1]; C. Ferreira[1]; K. Thomson[1]; L. Lue[1]; J. Sefcik[1]; Y. Chen[1]; [1] University of Strathclyde, Glasgow/UK	**Development of a supervisory control and data acquisition system for a continuous integrated antibody process** F. Feidl[1]; M. Sokolov[1]; A. Butté[1]; M. Morbidelli[1]; [1] ETH Zürich/CH
13:00	Lunch	

Wednesday, 10 May 2017

	Room: F2+F3	
	PLENARY LECTURES	
	Chair: F. Chauchard, Indatech, Pradez de Lez/F	
14:00	**PAT in a fast moving world** W. Broeckx, Procter & Gamble, Strombeek-Bever/B	
14:45	**PAT in a regulatory environment – risks and side-effects** W. Kessler, STZ Prozesskontrolle und Datenanalyse, Reutlingen/D	
15:30	Coffee Break	
	Room: F2+F3	Room: F1
	2A: PROCESS MONITORING AND CONTROL IN PHARMACEUTICAL INDUSTRY 2	**2B: PROCESS MONITORING AND CONTROL FOR BIOTECHNOLOGY 2**
	Chair: F. Chauchard, Indatech, Pradez de Lez/F	*Chair: S. Roussel, Ondalys/F*
16:00	**Batch level modelling in relative time** D. Alexandrakis[1]; [1] CAMO Software AS, Oslo/N	**A novel framework for automated feed phase identification** R. Nikzad-Langerodi[1]; E. Lughofer[1]; T. Zahel[2]; P. Sagmeister[2]; C. Herwig[3]; [1] Johannes Kepler University Linz/A; [2] Exputec GmbH, Vienna/A; [3] TU Wien/A
16:30	**Quantitative solid-state analysis of amorphous and crystalline forms of sulfamerazine using THz Raman spectrometry** J. Lothian[1]; A. Nordon[1]; P. Macfhionnghaile[1]; P. Dallin[2]; J. Andrews[2]; J. Carriere[3]; [1] University of Strathclyde, Glasgow/UK; [2] Clairet Scientific, Northampton/UK; [3] Ondax Inc., Monrovia/USA	**Identification of TOI and TOH by dielectric spectroscopy during oncolytic measles production** T. Grein[1]; D. Loewe[1]; H. Dieken[1]; D. Salzig[1]; T. Weidner[1]; P. Czermak[1]; [1] University of Applied Sciences Mittelhessen (THM)/ Institute of Bioprocess Engineering and Pharmaceutical Technology, Giessen/D
17:00	**Monte Carlo framework to verify product quality control under upstream process disturbances – An Ibuprofen case study** F. Montes[1]; K. Gernaey[2]; G. Sin[2]; [1] Technical University of Denmark (DTU), Lyngby/DK; [2] CAPEC-PROCESS research center, Department of Chemical and Biochemical Engineering, Technical University of Denmark, Lyngby/DK	**Electrooptical Monitoring of Cell Polarizability in Lactic Acid Bacteria Batch, Fed-Batch, Continuous and Scale-Down Fermentations** K. Pellicer Alborch[1]; R. Spann[2]; A. Angersbach[3]; A. Eliasson Lantz[2]; G. Sin[2]; K. Gernaey[2]; P. Neubauer[1]; S. Junne[1]; [1] TU Berlin, Fachgebiet Bioverfahrenstechnik, Berlin/D; [2] CAPEC-PROCESS research center, Department of Chemical and Biochemical Engineering, Technical University of Denmark, Kgs. Lyngby/DK; [3] EloSystems GbR, Berlin/D
	Chair: A. Nordon, University of Strathclyde, CPACT, Glasgow/UK	*Chair: J. Nolte, Inno-spec GmbH, Nürnberg/D*
17:30	**Poster Short Presentations Session A** (2 min, 1 sheet) (17:30 – 18:00)	**Poster Short Presentations Session B** (2 min, 1 sheet) (17:30 – 18:00)
18:00	**Poster Session A+B & Welcome Reception** (18:00 – 21:00)	

Thursday, 11 May 2017

Room: F2+F3

	PLENARY LECTURES
	Chair: M. Grosso, University of Cagliari/I
08:30	**Data analytics for industrial processes operation and control** J. A. Romagnoli, Louisiana State University, Baton Rouge, LA/USA
09:15	**Integrated Process Control – SPIRE Projects with High Impact for Process Industry** M. Pereira Remelhe[1]; F. Muller[2]; [1] Bayer AG, Leverkusen/D; [2] University of Leeds/UK
10:00	Coffee Break

	Room: F2+F3	Room: F1
	5 B: MODELLING AND CONTROL TECHNOLOGY	**3B: PROCESS MONITORING AND CONTROL IN REAL LIFE MANUFACTURING 1**
	Chair: M. Grosso, University of Cagliari/I	*Chair: J. Nolte, Inno-spec GmbH, Nürnberg/D*
10:30	**Multi-parametric control workflow of bioprocesses using mechanistic models** C. Herwig[1]; [1] TU Wien, Vienna/A	**Employing Micro Gas Chromats for Flare Analysis to meet Emission Regulations** G. Dewar[1]; S. Jackson[2]; [1] INEOS UK, Grangemouth/UK; [2] Siemens UK, Richmond/UK
11:00	**Hybrid bioprocess models – the new generation of models for efficient bioprocess development** M. Sokolov[1]; A. Butté[1]; M. Morbidelli[1]; [1] ETH Zürich/D	**Multiplexing gas chromatography for process analytics** M. Wunsch[1]; R. Lehnig[1]; O. Trapp[2]; [1] BASF SE, Ludwigshafen/D; [2] Ludwig-Maximilians-Universität München/D
11:30	**Multivariate statistical approaches to aid pharmaceutical processes: product development and process monitoring in a Quality-by-Design perspective** P. Facco[1]; M. Barolo[2]; F. Bezzo[2]; G. Bano[2]; [1] University of Padova, Padova/I; [2] Dipartimento di Ingegneria Industriale, University of Padova/I	**Spectroscopic process control in a cascaded injection process for complexly formed fiber-reinforced composite parts** M. Pawliczek[1]; S. Wohlfarth[1]; C. Schillfahrt[2]; D. Mungenast[3]; M. Brandstetter[1]; [1] RECENDT - Research Center for Non-Destructive Testing GmbH, Linz/A; [2] Chair of Processing of Composites, Department of Polymer Engineering and Science, Montanuniversität Leoben/A; [3] Thöni Industriebetriebe GmbH, Telfs/A
12:00	**Online Performance Monitoring of PAT-based Process and Control** N. Kerimoglu[1]; J. Appel[1]; [1] Clariant Produkte (Deutschland) GmbH, Burgkirchen/D	**Fiber Optical Raman Sensing for Process Analytics and Control** T. Frosch[1]; D. Yan[2]; P. Jürgen[2]; [1] Leibniz Institute of Photonic Technology Jena, Friedrich Schiller University Jena, Jena/D; [2] Leibniz Institute of Photonic Technology, Jena/D
12:30	Lunch	

Thursday, 11 May 2017

	Room: F2+F3	Room: F1
	Chair: O. Reich, InnoFSpec, Potsdam/D	*Chair: C. Herwig, TU Wien/A*
13:30	**Poster Short Presentations Session C** (2 min, 1 sheet)	**Poster Short Presentations Session D** (2 min, 1 sheet)
	4A: IMAGE ANALYSIS AND PROCESS TOMOGRAPHY	**4B: PROCESS MONITORING AND CONTROL IN REAL LIFE MANUFACTURING 2**
16:00	**Fast Raman measurements for liquid film observations in chemical process optimization** J. Deuerling[1]; F. Braun[1]; V. Kapoustina[1]; A. Hien[1]; A. Nguyen[1]; M. Nachtmann[1]; M. Rädle[1]; H. Bonart[2]; J. Repke[2]; S. Scholl[3]; [1] Hochschule Mannheim/Institut für Prozessmesstechnik und innovative Energiesysteme, Mannheim/D; [2] TU Berlin, Fachgebiet Dynamik und Betrieb technischer Anlagen, Berlin/D; [3] TU Braunschweig, Institut für Chemische und Thermische Verfahrenstechnik (ICTV), Braunschweig/D	**Online Spectroscopy in Microemulsions** K. Meyer[1]; A. Paul[1]; J. Ruiken[2]; F. Westad[3]; M. Illner[2]; D. Müller[2]; E. Esche[2]; J. Repke[2]; M. Maiwald[1]; [1] Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin/D; [2] TU Berlin/D; [3] CAMO Software AS, Oslo/N
16:30	**Endpoint determination of fluid bed coating process using real time imaging technique Eyecon** V. Naidu[1]; R. Deschpande[1]; M. Syed[1]; P. Wakte[2]; S. Costello[3]; E. Hogan[3]; [1] Wockhardt Research Centre, Aurangabad/IND; [2] Dr. Babasaheb Ambedkar Marathwada University, Aurangabad/IND; [3] Innopharma Technology, Dublin/IRL	**Feasibility of Next Generation Infrared Microspectrometers Demonstrated on Characterization of Zeolite Materials** P. Luoma[1]; P. Müller[1]; H. Kirchsteiger[2]; P. Kefer[2]; M. Brandstetter[1]; [1] RECENDT - Research Center for Non-Destructive Testing GmbH, Linz/A; [2] University of Applied Sciences Upper Austria - Research Group ASiC, Wels/A
17:00	**Near-infrared chemical imaging as an in-line monitoring tool for continuously freeze-dried pharmaceutical unit doses** D. Brouckaert[1]; L. De Meyer[1]; P. Van Bockstal[1]; B. Vanbillemont[1]; J. Corver[2]; T. De Beer[1]; [1] Ghent University/B; [2] RheaVita, Eindhoven/NL	**Highly concentrated cooling crystallization of L-glutamic acid and lactose, studied by Process Analytical Technologies** O. Reich[1]; R. Hass[1]; [1] University of Potsdam, Physical Chemistry – innoFSPEC, Potsdam/D
17:30	**Advanced methods of spectral imaging in food processing** R. Takacs[1]; D. Geier[1]; T. Becker[1]; [1] TU München, Lehrstuhl für Brau- und Getränketechnologie, Freising/D	**Advanced Technology for Online Water Analysis** O. Rothe[1]; [1] LAR Process Analysers AG, Berlin/D
19:30	**Conference Dinner at "Kutschstall"** Am Neuen Markt 9A, 14467 Potsdam	

Friday, 12 May 2017

Room: F2+F3

	PLENARY LECTURE
	Chair: S. Folestad, AstraZeneca, Mölndal/S
08:40	**New technologies in spectroscopy expanding the scope of PAT applications** J. Malinen, VTT - Technical Research Center of Finland, Oulu/ FIN
09:25	**Chemometrics in Image Analysis: insight into spatial, temporal and spectral information** C. Ruckebusch, Technical University of Lille/F

	Room: F2+F3	Room: F1
	3A: PROCESS MONITORING AND CONTROL IN PHARMACEUTICAL INDUSTRY 3 (New technologies)	**5A: CHEMOMETRICS 1**
	Chair: A. Nordon, University of Strahclyde, CPACT, Glasgow/UK	*Chair: S. Folestad, AstraZeneca, Mölndal/S*
10:15	**Fast MIR gas analysis for process monitoring using an MWIR-VNIR upconversion spectrometer** S. Wolf[1]; [1] Fraunhofer Institute for Physical Measurement Techniques, Freiburg/D	**High throughput and high automation tools coupled with chemometrics for efficient bioprocess development** M. Sokolov[1]; A. Butté[1]; M. Morbidelli[1]; J. Souquet[2]; H. Broly[2]; [1] ETH Zürich/CH; [2] Merck Serono S.A., Corsier-sur-Vevey/CH
10:45	**Coil-to-globule transformation and agglomeration in concentrated PNIPAM suspension investigated by a combination of spectroscopic inline methods** P. Werner[1]; O. Reich[2]; R. Hass[2]; [1] University of Potsdam/D; [2] University of Potsdam, Institute of Chemistry, Physical Chemistry – innoFSPEC, Potsdam/D	**Calibration transfer of a Raman spectroscopic method: what does it teach us?** D. Brouckaert[1]; J. Uyttersprot[2]; W. Broeckx[2]; T. De Beer[1]; [1] Ghent University/B; [2] Procter&Gamble, Strombeek-Bever/B
11:15	Coffee Break	

Friday, 12 May 2017

	Room: F2+F3	Room: F1
	3A: PROCESS MONITORING AND CONTROL IN PHARMACEUTICAL INDUSTRY 4 (New technologies)	**5 A CHEMOMETRICS 2**
	Chair: A. Nordon, University of Strahclyde, CPACT, Glasgow/UK	*Chair: S. Folestad, AstraZeneca, Mölndal/S*
11:45	**Design and Validation of a Compact NMR Analyser** S. Kern[1]; S. Guhl[1]; K. Meyer[1]; A. Paul[1]; L. Wander[1]; P. Gräßer[1]; M. Maiwald[1]; [1] Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin/D	**Sizing of Colloidal Particles via Hybrid Spectral Modeling of Raman Spectra** J. Meyer-Kirschner[1]; A. Mitsos[2]; J. Viell[2]; [1] RWTH Aachen University, Aachen/D; [2] RWTH Aachen University, AVT - Process Systems Engineering, Aachen/D
12:15	**Enabling Benchtop NMR Process Monitoring with Hyperpolarization** A. Parrott[1]; P. Richardson[2]; A. Nordon[1]; M. Halse[2]; S. Duckett[2]; [1] University of Strathclyde, Glasgow/UK; [2] University of York/UK	**On-line and data fusion strategies for NIR-based industrial batch process monitoring and control** R. de Oliveira[1]; A. de Juan[1]; [1] Universitat de Barcelona/E
12:45	**Advanced process control practices for continuous pharmaceutical twin-screw wet granulation** N. Nicolaï[1]; I. Nopens[1]; K. Gernaey[2]; T. De Beer[1]; [1] Ghent University (UGent), Gent/B; [2] Technical University of Denmark, Lyngby/DK	**How to bring that extra dimension?** J. Uyttersprot[1]; D. Brouckaert[2]; W. Broeckx[3]; [1] Procter&Gamble, Strombeek-Bever/B; [2] Laboratory of Pharmaceutical Process Analytical Technology, Ghent University, Ghent/B; [3] Procter&Gamble, Brussels/B

Room: F2+F3

	Chairs: A. Nordon, University of Strahclyde, CPACT, Glasgow/UK *M. Maiwald, Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin/D*
13:15	**Closing** **Award Session: Poster Prize, Siemens Prize**
13:30	Lunch /End of the conference

POSTER SHORT PRESENTATIONS

Wednesday, 10 May 2017, 17:30 – 18:00

Session A Process monitoring and control in real life manufacturing

Session B Process monitoring and control for biotechnology

Thursday, 11 May 2017, 13:30 – 14:00

Session C Process monitoring and control in pharmaceutical industry
Process monitoring and control in agro, food and feed

Session D Chemometrics
Modelling and control technology
Image analysis and process tomography
Others

PROCESS MONITORING AND CONTROL IN REAL LIFE MANUFACTURING

A 1.01 **Rugged FTIR to study bio-renewable processes**
J. Speed[1]; [1] Keit Spectrometers, Harwell/UK

A 1.02 **Challenges of Particle Size Distribution (PSD) of micro- and nanostructured Materials in Process Monitoring**
R. Retamal M.[1]; F. Babick[2]; M. Stintz[2]; [1] Technische Universitaet Dresden/D; [2] TU Dresden, Institut für Verfahrenstechnik und Umwelttechnik, Dresden/D

A 1.03 **Fast In-line monitoring of Continuous Reaction Processes by Mid-IR Quantum Cascade Lasers**
D. Boskovic[1]; W. Schweikert[2]; S. Panic[2]; S. Loebbecke[2]; R. Ostendorf[3]; J. Grahmann[4]; [1] Fraunhofer Institute for Chemical Technology ICT, Pfinztal/Berghausen/D; [2] Fraunhofer Institute for Chemical Technology ICT, Pfinztal/D; [3] Fraunhofer Institute for Applied Solid State Physics, Freiburg/D; [4] Fraunhofer Institute for Photonic Microsystems IPMS, Dresden/D

A 1.04 **PATAL: Industry 4.0 Software Solution for Process Analytics**
J. Erens[1]; M. Rohlof[2]; [1] PSG Petro Service GmbH & Co.KG, Steinbach Ts./D; [2] MedeaSystems GmbH, Kempen/D

A 1.05 **Process monitoring and control for continuous extrusion processes**
E. Ostertag[1]; T. Bäuerle[1]; J. Mannhardt[2]; G. Lorenz[1]; K. Rebner[1]; [1] Reutlingen University - Process Analysis and Technology PA&T, Reutlingen/D; [2] Blue Ocean Nova AG, Aalen/D

A 1.06 **Network-compatible Raman process sensor for analyzing liquids**
M. Klein[1]; [1] Blue Ocean Nova AG, Aalen/D

A 1.07 **On-line control of the rheological properties for a continuous production of a non-Newtonian fluid**
R. Mei[1]; M. Grosso[1]; R. Baratti[1]; S. Tronci[1]; [1] University of Cagliari/I

A 1.08 **Multimodal Spectroscopic Investigation for Inline Monitoring and Control of Extrusion Processes**
A. Lorenz[1]; P. Hitzer[1]; T. Bäuerle[1]; K. Rebner[1]; G. Lorenz[1]; [1] Reutlingen University - Process Analaysis and Technology (PA&T), Reutlingen/D

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A. Lambrecht[1]; J. Herbst[1]; E. Maier[1]; H. Pernau[1]; T. Strahl[1]; [1] Fraunhofer IPM, Freiburg/D

A 1.10 **Operation and Optimal Control of Multiphase Systems – Hydroformylation in Microemulsions on the Mini-plant Scale**
M. Illner[1]; K. Meyer[2]; A. Paul[2]; E. Esche[1]; M. Maiwald[2]; J. Repke[1]; [1] TU Berlin, Fachgebiet Dynamik und Betrieb technischer Anlagen, Berlin/D; [2] Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin/D

A 1.11 **Limitations of Formazine as calibration standard for Turbidity Process Probes**
M. Münzberg[1]; O. Reich[1]; R. Hass[1]; [1] University of Potsdam, Physical Chemistry – innoFSPEC, Potsdam/D

A 1.12 **Multi Modal Process Monitoring with Spectral Fiber Sensors**
V. Artyushenko[1]; F. Schulte[1]; O. Bibikova[1]; I. Usenov[1]; T. Sakharova[1]; T. Whittley[1]; [1] art photonics GmbH, Berlin/D

A 1.13 **Sampling Probes for In Situ Raman Measurements in Small Volume Liquid-Phase Reactors**
A. Pitters[1]; L. Ganster[2]; K. Esmonde-White[2]; I. Lewis[2]; [1] Kaiser Optical Systems SARL, Ecully/F; [2] Kaiser Optical Systems, Inc., Ann Arbor/USA

A 1.14 **Operation of libs elemental analyzers for inline analysis of aluminum scrap and industrial products**
A. Ahsan[1]; C. Bohling[1]; [1] SECOPTA analytics GmbH, Berlin/D

A 1.15 **Dynamic model based process performance monitoring for the life sciences**
A. Sahin[1]; A. Nordon[1]; J. Morris[1]; J. Pan[1]; [1] University of Strathclyde, Glasgow/UK

A 1.16 **Ultrasonic Process Analysis through Metallic Interfaces**
M. Ingram[1]; A. Gachagan[1]; A. Mulholland[1]; A. Nordon[1]; E. Becker[2]; [1] University of Strathclyde, Glasgow/UK; [2] BP Chemicals Ltd, Hull/UK

A 1.17 **Automated industrial process control based on life cycle management tools and NIR spectroscopy**
M. Pawliczek[1]; T. Natschläger[2]; T. Reischer[3]; W. Kantner[3]; M. Brandstetter[1]; [1] RECENDT - Research Center for Non-Destructive Testing GmbH, Linz/A; [2] Software Competence Center Hagenberg GmbH, Hagenberg/A; [3] Metadynea Austria GmbH, Krems/A

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G. Lloyd-Jones[1]; E. King[2]; R. Dooley[1]; A. Jones[1]; D. Uhrin[1]; A. Codina[3]; S. Groscurth[4]; [1] University of Edinburgh, Edinburgh/UK; [2] TgK Scientific Ltd, Bradford on Avon/UK; [3] Bruker UK Ltd, Coventry/UK; [4] Bruker BioSpin GmbH, Fällanden/CH

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N. Caillol[1]; [1] Axel'one, Solaize/F

LMP 1.20 **Discrimination strategies for polymer identification for continuous processes with on-line Near Infrared Spectroscopy**
J. Lallemand[1]; S. Montagnier[2]; P. Herbert[2]; J. Guilment[2]; S. Roussel[1]; [1] Ondalys, Clapiers/F; [2] Arkema, Serquigny/F

LMP 1.21 **Online NMR spectroscopy for process monitoring in intensified continuous production plants**
S. Guhl[1]; [1] Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin/D

LMP 1.22 **Online-NIR measurements in viscose spin bath – scope and limitations**
S. Leitner[1]; G. Mayr[1]; T. Röder[2]; [1] Kompetenzzentrum Holz GmbH, Linz/A; [2] Lenzing AG, Lenzing/A

LMP 1.23 **UV-Vis spectroscopy as a tool for online tar measurements in wood gasification Processes**
P. Edinger[1]; C. Ludwig[1]; [1] École polytechnique fédérale de Lausanne, Lausanne/CH

LMP 1.24 **PROSPECT liquid scale up facility for process development and metrological studies**
K. Roettger[1]; A. Smith[1]; M. Taylor[1]; J. Carroll[1]; P. Threlfall-Holmes[2]; E. Martin[3]; S. Bakalis[4]; W. Poon[5]; [1] The Centre for Process Innovation, Wilton/UK; [2] TH Collaborative Innovation, Newcastle upon Tyne/UK; [3] University of Leeds, Leeds/UK; [4] University of Birmingham, Birmingham/UK; [5] University of Edinburgh, Edinburgh/UK

LMP 1.25 CXL **Integrated Process Control – SPIRE Projects with High Impact for Process Industry**
M. Pereira Remelhe[1]; F. Muller[2]; [1] Bayer AG, Leverkusen/D; [2] University of Leeds, Leeds/UK

LMP 1.26 **FUDIPO: Future Directions of Production Planning and Optimized Energy and Process Industries**
E. Dahlquist[1]; K. Kyprianidis[1]; M. Bohlin[2]; A. del Real[3]; M. González-Moya[3]; [1] Mälardalen University, Västerås/S; [2] RISE SICS, Västerås/S; [3] IDENER, Seville/E

LMP 1.27 **FUDIPO: Experiments in pilot and full-scale facilities**
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LMP 1.28 **ProPAT: Robust and affordable process control technologies for improving standards and optimising industrial operations**
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LMP 1.29 **DISIRE: A glimpse to the future of the process industry**
G. Nikolakopoulos[1]; A. Lewandowska[2]; G. Georgoulas[1]; T. Dauth[2]; [1] LTU, Luleâ/S; [2] IMW, Leipzig/D

PROCESS MONITORING AND CONTROL IN PHARMACEUTICAL INDUSTRY

C 2.01 **Improved control of activated carbon absorption units with gas analysis mass spectrometry**
G. Lewis[1]; R. Wright[1]; D. Merriman[1]; [1] Thermo Fisher Scientific, Winsford/UK

C 2.02 **Generating reliable quantitative solvent drying process data in the pharmaceutical Industry with gas analysis mass spectrometry**
G. Lewis[1]; R. Wright[1]; D. Merriman[1]; [1] Thermo Fisher Scientific, Winsford/UK

C 2.06 **In situ Raman measurements of pharmaceutical solids during process unit operations**
A. Pitters[1]; K. Esmonde-White[2]; C. Uerpmann[1]; S. Gilliam[2]; L. Ganster[2]; I. Lewis[2]; [1] Kaiser Optical Systems SARL, Ecully/F; [2] Kaiser Optical Systems, Inc., Ann Arbor/USA

C 2.07 **Monitoring Biphasic Mixtures In Continuous Flow Systems**
A. Ngama[1]; A. Nordon[2]; R. Hart[3]; A. McIntyre[3]; A. O'Kearney-McMullan[3]; C. Fernandez Barrat[3]; [1] University of Strathclyde, Hamilton/UK; [2] University of Strathclyde, Glasgow/UK; [3] AstraZeneca, Macclesfield/UK

C 2.09 **Implementation of in situ FT-IR as PAT tool: Reaction Analysis during a Pharmaceutical Hydrogenation**
W. Kowalchik[1]; F. Eigenmann[2]; [1] Mettler-Toledo, Columbia/USA; [2] Mettler-Toledo AutoChem, Zürich/CH

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F. Chauchard[1]; D. Alexandris[2]; [1] Indatech, Prades Le Lez/F; [2] Camo/UK

LMP 2.12 **Comparison of the three existing approaches for on-line calibration model transfer, update and maintenance**
S. Roussel[1]; S. Preys[1]; M. Zeaiter[2]; S. Holland[2]; [1] Ondalys, Clapiers/F; [2] GSK, Ware/UK

LMP 2.13 **Monitoring powder blend homogeneity in a tablet press feed frame using near infrared spectroscopy**
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LMP 2.14 **Microwave spectroscopy: Matrix effects and interferences on water determinations in pharmaceutical formulations**
A. Sparén[1]; H. Thoroddsen[2]; Á. Díaz-Bolado[1]; O. Svensson[1]; [1] AstraZeneca R&D Gothenburg, Mölndal/S; [2] Chemical Engineering, Chalmers University of Technology, Göteborg/S

LMP 2.15 **Quantitative transmission Raman and NIR spectroscopy for the determination of drug substance in pharmaceutical tablets**
A. Sparén[1]; J. Johansson[1]; A. Blåberg[2]; M. Hartman[3]; M. Fransson[1]; S. Folestad[1]; M. Claybourn[4]; O. Svensson[1]; [1] AstraZeneca R&D Gothenburg, Mölndal/S; [2] The Sahlgrenska Academy, University of Gothenburg, Göteborg/S; [3] Analytical Pharmaceutical Chemistry, University of Uppsala, Uppsala/S; [4] AstraZeneca Macclesfield, Macclesfield/UK

LMP 2.16 **New approaches to the analysis of reactions using NMR**
I. Clegg[1]; [1] Bruker UK, Coventry/UK

LMP 2.17 **Quantification of solid pharmaceutical samples using modified specular reflectance accessory**
T. Czaja[1]; S. Mazurek[1]; R. Szostak[1]; [1] University of Wroclaw, Wrocław/PL

PROCESS MONITORING AND CONTROL IN AGRO, FOOD AND FEED

C 3.01 **Online Process Monitoring Using Compact Mid-Infrared Spectrometers**
D. Sellin[1]; S. Baum[1]; R. Bischof[1]; [1] IRPC Infrared - Process Control GmbH, Hamburg/D

C 3.02 **Process characterization of Lactobacillus acidophilus fermentation by means of different process analytical technologies (PAT)**
S. Dounia[1]; M. Schmacht[1]; M. Hageböck[1]; M. Senz[1]; [1] VLB Berlin e.V., Berlin/D

C 3.03 **Fouling detection in spray drying towers by means of ultrasound sensing**
M. Ubeda[1]; D. Geier[1]; T. Becker[1]; [1] TU München, Lehrstuhl für Brau- und Getränketechnologie, Freising/D

C 3.04 **Monitoring the quality of commercial extra virgin olive oils with Fluorescence spectroscopy**
P. Mishra[1]; L. Lleó García[2]; N. Hernández-Sánchez[2]; T. Cuadrado Domínguez[2]; M. Ruiz-Altisent[2]; [1] University of Strathclyde, Glasgow/UK; [2] Technical University of Madrid/E

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C 3.06 **Development of a multi-parametric control strategy for E. coli fed-batch processes using MPC and mechanistic models**
S. Ulonska[1]; I. Stelzer[2]; C. Herwig[2]; [1] Institute of Biochemical Engineering, TU Wien/A; [2] Institute of Biochemical Engineering, CD Laboratory on Mechanistic and Physiological Methods for Improved Bioprocesses, TU Wien/A

LMP 3.07 **Applying extreme value theory on near InfraRed spectroscopy predictions of moisture content in milk powder**
P. Skou[1]; S. Holroyd[2]; F. van den Berg[1]; [1] University of Copenhagen, Frederiksberg/DK; [2] Fonterra Research and Development Centre, Palmerston North/NZ

LMP 3.08 **Enzymtic protein batch process monitoring using fluorescence spectroscopy**
C. Eskildsen[1]; D. Lindberg[1]; N. Afseth[1]; J. Wold[2]; [1] Nofima, Ås/N; [2] Nofima, Ås/D

LMP 3.09 **Determining moisture in pasta by vibrational spectroscopy**
T. Czaja[1]; R. Szostak[1]; E. Kuzawińska[2]; A. Sobota[2]; [1] University of Wroclaw, Wrocław/PL; [2] Lublin University of Life Sciences, Lublin/PL

LMP 3.10 **Determination of concentration of dissolved ozone in ultrapure water by UV spectroscopy**
I. Staude[1]; J. Dörrich[1]; M. Belz2; K.-F. Klein[1]; H. Platen[1]; [1] Technische Hochschule Mittelhessen, /D2 World Precision Instruments Germany GmbH (WPI), Berlin/D

PROCESS MONITORING AND CONTROL FOR BIOTECHNOLOGY

B 4.01 **Observation of a multiphase solvent system employing in-situ IR- and Raman spectroscopy**
A. Echtermeyer[1]; M. Aigner[2]; J. Viell[1]; A. Jupke[2]; A. Mitsos[1]; [1] RWTH Aachen University – Process Systems Engineering (AVT.SVT), Aachen/D; [2] RWTH Aachen University – Fluid Process Engineering (AVT.FVT), Aachen/D

B 4.02 **Quantification of changes of tryptophan and NADH fluorescence due to glucose pulses during ethanol growing yeast cells**
S. Assawajaruwan[1]; P. Eckard[1]; B. Hitzmann[1]; [1] Universität Hohenheim, Stuttgart/D

B 4.03 **Perspective on the application of multivariate technologies in biopharmaceutical manufacturing**
C. MCCREADY[1]; [1] MKS Instruments, LONDON/CDN

B 4.04 **Process Raman Spectroscopy in the Biocatalyzed Synthesis of a Nonsteroidal Anti-Inflammatory Drug**
H. Eckhardt[1]; A. Stöbener[2]; [1] tec5 AG / Product Manager Systems, Oberursel/D; [2] Institute of Technical Biocatalysis Hamburg University of Technology, Hamburg/D

B 4.05 **Glucose oxidase-based sensor for online glucose monitoring and control in mammalian cell culture bioreactors**
M. Tric[1]; M. Lederle[1]; P. Wiedemann[2]; S. Wölfl[3]; T. Werner[1]; [1] Mannheim University of Applied Sciences - Institute of Analytical Chemistry, Mannheim/D; [2] Mannheim University of Applied Sciences - Institute of Molecular and Cell Biology, Mannheim/D; [3] Heidelberg University - Institute of Pharmacy and Molecular Biotechnology (IPMB), Heidelberg/D

B 4.07 **The Path to a Control Strategy: A Perspective from Process Development**
J. Studts[1]; D. Böth[1]; J. Stolzengerger[1]; [1] Boehringer Ingelheim Pharma GmbH & Co. KG, Biberach/D

B 4.08 **Integrated Process Development and Advanced Process Control of Mammalian Cell Culture Bioprocesses**
W. Sommeregger[1]; K. Kandra[2]; B. Sissolak[2]; G. Striedner[2]; M. Luchner[2]; G. Berghammer[1]; P. Pino-Grace[1]; M. von Stosch[3]; M. Mayer[4]; [1] Bilfinger Industrietechnik Salzburg GmbH, Salzburg/A; [2] DBT - University of Natural Resources and Life Sciences (BOKU), Vienna/A; [3] CEAM - Newcastle University, Newcastle/UK; [4] evon GmbH, Gleisdorf/A

B 4.09 **Analytical module for segmented flow processes using Surface enhanced Raman Spectroscopy**
A. Mendl[1]; D. Boskovic[2]; M. Köhler[3]; [1] Fraunhofer Institute Chemical Technology ICT, Pfinztal/D; [2] Fraunhofer ICT, Pfinztal/D; [3] TU Ilmenau/D

B 4.10 **Many eyes make light work: Multi Spectral Fiber System for Process Monitoring**
F. Schulte[1]; V. Artyushenko[1]; I. Usenov[1]; A. Bocharnikov[1]; T. Sakharova[1]; [1] art photonics GmbH, Berlin/D

B 4.11 **Implementation of a new method for online glucose control in a 10 L CHO bioprocess**
F. Aupert[1]; D. Solle[2]; T. Scheper[2]; [1] Leibniz Universität Hannover, Hannover/D; [2] Institut für Technische Chemie, Leibniz Universität Hannover, Hannover/D;

B 4.12 **Inline Concentration Profiles in Enzyme Catalyzed Reactive Distillation using Infrared Spectroscopy**
M. Christlieb[1]; S. Kühn[1]; R. Hiessl[1]; J. Kleber[1]; A. Stöbener[1]; I. Smirnova[2]; A. Liese[1]; [1] Institute of Technical Biocatalysis, Hamburg University of Technology, Hamburg/D; [2] Institute of Thermal Separation Processes, Hamburg University of Technology, Hamburg/D

B 4.13 **Monitoring the Cultivation of Mammalian Cells via UV/VIS-Spectroscopy in Combination with Multivariate Curve Resolution**
T. Drieschner[1]; B. Boldrini[1]; K. Rebner[1]; [1] Reutlingen University - Process Analaysis and Technology (PA&T), Reutlingen/D

B 4.14 **Innovative methods of knowledge-driven methanol feedback control and state estimation for recombinant Pichia pastoris fed-batch cultivation**
V. Brunner[1]; M. Metzenmacher[1]; S. Birle[1]; G. Dominik[1]; T. Becker[1]; [1] TU München, Lehrstuhl für Brau- und Getränketechnologie, Freising/D

B 4.15 **Volatile metabolites for on-line process control of Yeast Fermentation**
A. Sippel[1]; J. Baumbach[1]; J. Zierow[2]; C. Halbfeld[3]; E. Pollmann[4]; [1] Reutlingen University, Reutlingen/D; [2] B&S Analytik, Dortmund/D; [3] RWTH Aachen University, Aachen/D; [4] Research Institute of Baker's Yeast, Berlin/D

B 4.16 **Raman spectroscopy for improved understanding and control in pharmaceutical and biotechnology processes**
A. Pitters[1]; S. Gilliam[2]; M. Cuellar[2]; K. Esmonde-White[2]; I. Lewis[2]; [1] Kaiser Optical Systems SARL, Ecully/F; [2] Kaiser Optical Systems, Inc., Ann Arbor/USA

B 4.17 **Improving monitoring of cell culture using Raman Spectroscopy on CHO cell culture**
M. Li[1]; B. Ebel[1]; A. Marc[1]; F. Chauchard[2]; D. Alexandris[3]; [1] CNRS, Nancy/F; [2] Indatech, Prades Le Lez/F; [3] Camo/UK

LMP 4.18 **Real-Time monitoring of volatile compounds by PTR-MS technology**
R. Gutmann[1]; J. Herbig[2]; K. Winkler[2]; G. Striedner[3]; M. Luchner[3]; P. Sulzer[2]; [1] Ionicon, Innsbruck/A; [2] Ionicon Analytik, Innsbruck/A; [3] Universität für Bodenkultur Wien, Wien/A

LMP 4.19 **Process mapping in fermentation processes using 2-D fluorescence spectroscopy**
S. Narayana[1]; [1] University of Copenhagen, Copenhagen/DK

LMP 4.20 **Prospective of Au- Chitosan Polymer- Silty Clay Disinfecting Material for Low Cost Point of Use Water Purification**
M. Din[1]; [1] University of Punjab, Lahore/PK

CHEMOMETRICS

D 5.01 **Click" analytics for "click" chemistry – a simple method for calibration-free evaluation of online NMR spectra**
S. Kern[1]; A. Michalik-Onichimowska[1]; J. Riedel[1]; U. Panne[1]; R. King[2]; M. Maiwald[1]; [1] Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin/D; [2] Berlin University of Technology, Berlin/D

D 5.02 **tptcloud.com: A full-featured chemometrics software online**
A. Bogomolov[1]; V. Galyanin[2]; V. Belikov[2]; V. Belikova[2]; [1] Global Modelling, Aalen/D; [2] Samara State Technical University, Samara/RUS

D 5.03 **Utilizing machine learning for the multi-objective self-optimisation of chemical reaction systems**
A. Schweidtmann[1]; N. Holmes[2]; E. Bradford[3]; R. Bourne[2]; A. Lapkin[4]; [1] RWTH Aachen University, Aachener Verfahrenstechnik, Lehrstuhl für Systemverfahrenstechnik, Aachen/D; [2] University of Leeds/UK; [3] Norwegian University of Science and Technology, NTNU, Trondheim/N; [4] University of Cambridge, Department of Chemical Engineering and Biotechnology, Cambridge/UK

D 5.04 **Rapid Barley Variety Identification through Capillary Electrophoresis and Disjoint Principle Component Analysis**
I. Whitehead[1]; A. Munoz[2]; S. Birle[2]; D. Geier[2]; T. Becker[2]; [1] TU München, Lehrstuhl für Brau- und Getränketechnologie, Freising/D; [2] TU München, Freising/D

D 5.05 **Use of a novel mid-infrared spectrometer for in situ analysis of liquids**
C. McFarlan[1]; A. Nordon[1]; J. Dunn[1]; J. Speed[2]; [1] University of Strathclyde, Glasgow/UK; [2] Keit Spectrometers, Oxford/UK

LMP 5.06 **Orthogonalisation method for robustness improvement of online NIR applications**
P. Dubuc[1]; J. Lallemand[2]; J. Guilment[1]; S. Montagnier[1]; S. Roussel[2]; [1] Arkema, Serquigny/F; [2] Ondalys, Clapiers/F

LMP 5.07 **Increasing the wavelength reproducibility of diode-array spectrometers for chemometric applications**
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C. Jordan[1]; B. Haddadi[1]; M. Harasek[1]; [1] TU Wien, Institute of Chemical Engineering, Vienna/A

LMP 6.03 **FUDIPO: Modelling approach**
E. Dahlquist[1]; K. Kyprianidis[1]; M. Bohlin[2]; A. del Real[3]; M. González-Moya[3]; [1] Mälardalen University, Västerås/S; [2] RISE SICS, Västerås/S; [3] IDENER, Seville/E

LMP 6.04 **ProPAT – Novel inline particle sizing sensor for process control**
F. Muller[1]; [1] University of Leeds/UK

LMP 6.05 **ProPAT – Validation of a fast and low-cost NIR spectroscopy platform for online monitoring and process control**
F. Muller[1]; [1] University of Leeds/UK

IMAGE ANALYSIS AND PROCESS TOMOGRAPHY

D 7.01 **In-line acquisition of particle size distributions**
M. Lichti[1]; H. Bart[1]; [1] TU Kaiserslautern, Lehrstuhl für Thermische Verfahrenstechnik, Kaiserslautern/D

D 7.02 **In-line analysis of entrainment**
J. Schulz[1]; H. Bart[1]; [1] TU Kaiserslautern, Lehrstuhl für Thermische Verfahrenstechnik, Kaiserslautern/D

D 7.03 **Labelfree high content screening based on multimodal spectroscopic imaging for point-of-care biomedical diagnosis and digital pathology**
M. Stefanakis[1]; E. Ostertag[1]; S. Luckow-Markgraf[1]; R. Kessler[2]; K. Rebner[1]; [1] Reutlingen University - Process Analaysis and Technology (PA&T), Reutlingen/D; [2] Reutlingen University - STZ Process Control and Data Analysis, Reutlingen/D

D 7.04 **Real-time monitoring of twin screw granulation using image analysis**
J. Lothian[1]; A. Nordon[1]; P. Hamilton[2]; R. Elkes[2]; [1] University of Strathclyde, Glasgow/UK; [2] GlaxoSmithKline, Stevenage/UK

OTHERS

D 8.01 **Determination of particle/droplet size distributions in highly filled dispersions by Photon Density Wave spectroscopy**
L. Bressel[1]; R. Hass[1]; O. Reich[1]; [1] University of Potsdam, Institute of Chemistry, Physical Chemistry - innoFSPEC, Potsdam/D

D 8.02 **In-line monitoring of Phase Inversion Temperature polymerization of Styrene with Photon Density Wave spectroscopy and Particle Vision Microscopy**
M. Münzberg[1]; O. Reich[1]; R. Hass[1]; [1] University of Potsdam, Physical Chemistry – innoFSPEC, Potsdam/D

LMP 8.03 **Intensified by Design® for the intensification of processes involving solids handling: IbD**
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ProcessAutomation
@ACHEMA
THE KEY TO FLEXIBILITY
AND COMPETITIVENESS

#processautomat

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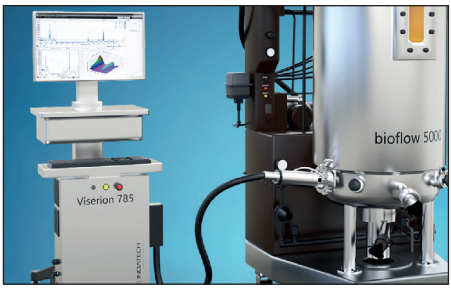
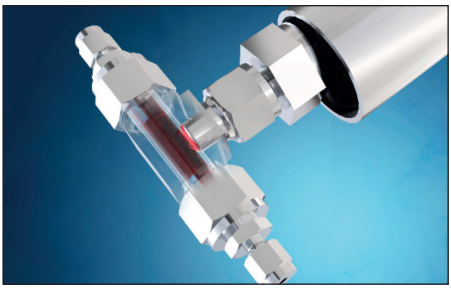
Upstream Process (USP)



- Quantitative analysis of nutriments and metabolites
- Pilot to large production scale-up
- Laser safety interlock option
- OPC-UA for communication with PLC
- Industrial stainless steel enclosure
- Simultaneous multichannel batch capabilities

Downstream Process (DSP)



- Specific flow cell for 1/8 connector
- Prediction of purity
- Abnormal spectra / event identification
- Product identification
- Start point/end-point detection
- Single use compatibility

Packaging machine inspection

- Fast analysis of critical parameter
- Automatic detection of capsule and empty spot
- In line (packaging or filling machine)
- Works with aluminum or plastic foil
- Fast measurement (10 ms for 100 measurements)
- Machine communication capabilities
- Easy integration & maintenance

In Process Quality control System (transportable)

- Fast analysis of critical parameters
- Identify critical unstability on batch to recorrect production
- Understand filling process at large scale for final scale up study
- Fast Production machine acceptance campaign
- Investigate production efficiency and stability on different production site (Performance uniformisation)

21CFR Part 11 compliance
Full IQ/OQ/PQ support
GMP compliance

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