Program for the 4th Ph.D. Workshop of the SPP 2364

Kick-off for the 2nd phase

25.-26.11.2025

GenoHotel Karlsruhe

Am Rüppurrer Schloss 40

76199 Karlsruhe

Tuesday, 25.11.2025

Ph.D. Workshop: How I did it!

13.00-14.30	Dr. Claas Klasen (former Evonik industries)
14.30-15.00	Coffee break
15.00-16.30	Dr. Zoltan Nagy (University of Purdue)
16.30-18.00	Discussion, open topics
18.00	Dinner

Wednesday, 26.11.2025

Trip to BASF, Ludwigshafen

07.00	Departure at the GenoHotel
	Program see attached
17.00	Arrivial at rail station Karlsruhe

Autonomous processes in particle technology

DFG Priority Program @ BASF

Time	Location	Agenda
		Wednesday 26th November 2025
		Independent arrival of external participants by bus 📌 *Gesellschaftshaus der BASF* *Wöhlerstrasse 15* *67063 Ludwigshafen*
09:00	Gesellschaftshaus Courtyard / Entrance area	Welcome by BASF representatives *- Automation Technology* *- Solids Formulation and Handling*
09:15 - 09:45	Gesellschaftshaus Juliuszimmer II *(1st floor to the left)*	Hermann Nirschl *(KIT)* *SPP Priority Program Overview* *+ short Q&A*
09:50 - 10:20	"	Mohamed Tarek Aboelnour *(GEM/TA)* *Automation of Melt Crystallization* *+ short Q&A*
		~~~ Coffee Break ~~~
10:45 - 11:30	Juliuszimmer II + III	Poster session *(Particle Synthesis)*
11:35 - 12:20	Juliuszimmer II + III	Poster session *(Particle Handling, Formulation)*
12:25 - 12:55	Juliuszimmer II	Career @ BASF + Q&A session *Sabrina Turba (RG/H)*
12:55 - 13:00	"	Closing remarks
13:00 - 14:00	Festsaal *(2nd floor)*	"Create your Bowl" - Buffet
		Bus tour BASF Ludwigshafen *Duration: 1 hour* 📌 *Start & End @ Parking lot Gesellschaftshaus der BASF*
15:00		End of event

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Group 1: Particle synthesis

Project title	ID	Process	Characterization	Modelling	Control scheme	Correspondence
Autonomous control of a process chain for CO_2 carbonation by use of mine waste	1	Extraction / Filtration / Precipitation	Ion concentration, turbidity, moisture, pH, PSD	Population balancing	Learning-based adaptive robust control (SLARC)	Bajcinca Gleiss Sundmacher
Model-based process control for transferred arc synthesis of nanoparticles	2	Arc synthesis of nanoparticles	Real-time mobility distribution monitoring utilizing Partector (number, diameter, mass)	Empirical correlations between aerodynamic and mobility diameter, CTIML based kernel models for concentration, surface area, volume of agglomerates	CTIML: Control theory informed machine learning	Ding, Kruis
Synthesis of highly functional nanoparticles via a sol-gel process using X-ray scattering methods: from process development to process control	3	Sol-gel synthesis of nanoparticles	UV-Vis, temperature	Discrete time linear approximation of the nonlinear PDE-ODE system using dynamic mode decomposition (DMDc)	Hybrid moving horizon estimator (MHE) design for real-time particle property estimation, hierarchical particle property control using model predictive control (MPC)	Meurer, Nirschl
Model-based control of the dynamics during fine grinding in wet-operated stirred media mills	4	Wet-operated stirred media milling	Ultrasonic extinction spectrometry for PSD and viscosity, dynamic light scattering	CFD-DEM simulation and predictive AI driven modelling with PB integration and DoE	NMPC for particle size distributions, alternating direction method of multipliers (ADMM) for fast and reliable optimization to ensure the controllability	Kirches, Schilde
ARCO-CRYSTAL: Adaptive robust predictive control of continuous slug flow cooling crystallization	5	Continuous slug flow crystallization	inline detection of fouling	Sequencing method for convection (coupling of velocity, time step, discretization), Monte Carlo simulation for PBE (crystallization)	Adaptive robust predictive control	Lucia, Wohlgemuth

Agenda

Save the date: 26.11.2025 **9:00 - 13:00**

Gesellschaftshaus: Juliuszimmer
Wöhlerstrasse 15, 67063 Ludwigshafen

09:15 - 10:20
- KIT Talk: Overview of SPP
- BASF Talk: Automation

10:45 - 11:30
Open Poster Session
Group 1

11:35 - 12:20
Open Poster Session
Group 2&3

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Group 2: Particle handling

Project title	ID	Process	Characterization	Modelling	Control scheme	Correspondence
Autonomous structure formation processes in spray fluidized bed agglomeration	6	Fluidized bed agglomeration	Model-based measurement of agglomerate structure via image scanning, Particle tracking velocimetry	Data-driven modelling of PSD, PBE with empirical porosity distribution	PBE-based Lyapunov control & Data-driven MPC, PID-control (inner loop) and Model-predictive control (outer loop) for bed temperature	Bück, Kienle, Tsotsas
Adaptive optimal control of continuous aqueous two-phase flotation (ATPF)	7	Aqueous two-phase flotation (ATPF)	UV-Vis, conductivity	Differential algebraic equations	Adaptive optimal control, stochastic optimal control strategies, model-informed Bayesian optimization	Diehl, Nirschl
Model-based process control for dynamic and efficient operation of liquid/liquid mixer-settler systems	8	Mixer-settler units for liquid/ liquid systems	Inline photo-optical particle size measuring technique (SOPAT endoscope), Speedgoat (digital signal processor)	Dynamical models for mean droplet size diameters and surface area of droplets	Closed-loop control with a linear model for the mean drop diameter and interfacial area, Extended Kalman-Filter (EKF) for gain- and drift-estimation	Knorn, Kraume

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- 11:35 - 12:20 Open Poster Session *Group 2&3*

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Group 3: Formulation

Project title	ID	Process	Characterization	Modelling	Control scheme	Correspondence
Autonomous and self-adapting, high-resolution 3D additive manufacturing by high energy impacts of fine particles	9	Impaction via Laval nozzle for additive manufacturing	High Speed Particle Image Velocimetry (H-PIV)	Reduced heat and energy balance, Radial basis function network (RBFN)	Ljapunov controller design approach, optimization via loss function	Antonyuk, Palis
Model-based quality control in continuous manufacturing of pharmaceutical granules (QC4CM)	10	Continuous wet granulation and drying in twin screw extruder	NIR, PSD (Parsum) as an inline photo-optical particle size measuring technique	Bayesian optimization	PSD, moisture control via NMPC, Extended Kalman Filter	Abel, Breitkreutz
Formulation of dispersed systems via (melt) emulsification: Process design, in situ diagnostics and regulation	11	Melt emulsification	Broadband Elastic Light Scattering (BELS)	Reduced system description: Gaussian process regression, Unscented transformation	MPC with reduced rotor-stator device model	Graichen, Huber, Schmidt
Model-based control of spray synthesis of structured granules with specified properties: experimental developments and challenges	12	Spray synthesis of structured granules	Inline photo-optical particle size measuring technique (SOPAT)	Data-driven correlation of inline measurements with product quality in order to control process parameters	Autonomous process control via in- / on-line measurements of feed, product and dependent process parameter	Peuker, Schmidt

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