

International Online Workshop on Continuous Particle Synthesis and Product Design

04-06 October 2021

Continuous particle synthesis is of key importance for the understanding and scalable fabrication of complex particulate products. The generation of products with tailored properties, ideally multifunctional, is of utmost importance, requiring control of all five dimensions of size, shape, surface, structure and composition.

To achieve this, a multidisciplinary approach is necessary, combining new reactors and reaction concepts for continuous manufacturing of new materials and products with modelling, simulation and optimization. Materials of interest range from noble metals and semiconductors, porous materials like metal organic frameworks to polymers and pharmaceutical materials. These can be agglomerated into so-called supraparticles that form superstructures with tailored and completely new - for instance optical - properties. Characterization, ideally inline, and process control are additional pillars, which are mandatory to achieve new materials with new properties with high throughput and on demand.

From 04 to 06 October 2021, the Erlangen Collaborative Research Centre 1411 on “Design of Particulate Products” (www.crc1411.research.fau.eu) organises an international workshop on continuous particle synthesis and product design. Experts with the diverse perspectives described above will review the status quo of the continuous synthesis of particulate products using state-of-the-art and newly developed methodologies.

A special focus is laid upon the identification of key challenges and intersections of the different techniques. The latter is of particular importance, as the fabrication of complex particle systems of continuously increasing complexity require diverse and interdisciplinary approaches and multidisciplinary teams. The scientific exchange between different experts in the field of particle synthesis and product design aims to identify future prospects of continuous particle formation. Overall, the workshop format will promote intense discussions and exchange between the participants and may thus become the nucleus of future joint activities.

Participation at the workshop is **free of charge** but registration is mandatory to log into the online event via ZOOM.

Further information and registration is available on the workshop website:

<https://www.crc1411.research.fau.eu/upcoming-events/international-online-workshop-on-continuous-particle-synthesis-and-product-design/>

Workshop programme:

04 October 2021

12:00 Welcome address by Wolfgang Peukert (FAU), Doris Segets (UDE) and Lukas Pflug (FAU)

Session 1: New materials & products: Continuous processes for product design I

12:20 Process design for continuous supercritical hydrothermal synthesis process and the materials design Tadafumi Adschiri
Tohoku University, Japan

12:40 Preparation of CeO₂ nanoparticles by continuous hydrothermal synthesis: experimental and modelling results Michael Türk
KIT, Germany

13:00 Continuous flow synthesis of silver nanowires: Mechanism, reaction & reactor engineering Amol A. Kulkarni
CSIR, NCL, India

13:20 Continuous flow synthesis of anisotropic particles with tailored morphology and optical properties Robin Klupp Taylor
FAU, Germany

13:40 Discussion with the speakers

14:10 Break

Session 2: New materials & products: Continuous processes for product design II

14:50 How to translate batch into continuous processes: Solutions for high temperature quantum dot synthesis Doris Segets
UDE, Germany

15:10 Continuous synthesis of porous materials Martin Hartmann
FAU, Germany

15:30 Synthesis and assembly of nanoparticles in flow Klavs F. Jensen
MIT, USA

15:50 Formulation and design of particles within continuously and at high pressure operated microsystems for pharmaceutical applications Arno Kwade
TU Braunschweig, Germany

16:10 Discussion with the speakers

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Session 3: Reactors and reaction concepts

10:00 Continuous provision of pure enantiomers from racemic feed mixtures exploiting preferential crystallization Andreas Seidel-Morgenstern
MPI Magdeburg, Germany

10:20 Flow microreactor synthesis of metallic nanoshells and MOF@MOF core-shell particles Satoshi Watanabe
Kyoto University, Japan

10:40 Microreaction technologies for continuous preparation of particles Guangsheng Luo
Tsinghua University, China

11:00 Microfluidic synthesis of polymer and metal / polymer composite particles Michael Köhler
TU Ilmenau, Germany

11:20 Discussion with the speakers

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Session 4: Modelling, simulation, optimization & scale up I

11:00	Particle nucleation and growth coupled to fluid flow: A novel exact method of moments approach	Lukas Pflug & Tobias Schikarski <i>FAU, Germany</i>
11:30	TBA	Arne Hoffmann <i>BASF, Germany</i>
11:50	Development of a modelling framework for the coprecipitation of NMC hydroxides as precursors for Li-ion cathodes	Daniele Marchisio <i>Polito, Italy</i>
12:10	Discussion with the speakers	
12:40	Break	

Session 5: Modelling, simulation, optimization & scale up II

13:10	TBA	TBA
13:30	TBA	TBA
13:50	Robust protection against uncertainty in particle design: Insights from mathematical optimization	Frauke Liers <i>FAU, Germany</i>
14:10	Continuous flow routes toward designer metal nanocrystals	Sara Skrabalak <i>Indiana University, USA</i>
14:30	Discussion with the speakers	
15:00	Closing remarks by Wolfgang Peukert (FAU)	