



September 25 – 29, 2011 · Berlin · Germany

PROGRAMME

8th ECCE  **2011**
September 25–29 · Berlin · Germany



PROCESSNET
EINE INITIATIVE VON DECHEMA UND VDI-GVC

8th European Congress of Chemical Engineering

together with

ProcessNet-Annual Meeting

EFCE Event No. 693

ECAB European Congress of
Applied Biotechnology



DECHEMA
Gesellschaft für Chemische Technik
und Biotechnologie e.V.

1st European Congress of Applied Biotechnology

together with

**29th DECHEMA's Biotechnology
Annual Meeting**

www.ecce2011.de

www.ecab2011.eu

Hall 1		
PLENARY LECTURE		
Chair:	K. Wagemann, DECHEMA e.V., Frankfurt/D	
09:00	Biopharmaceutical process development: the shortcut to the market R.G. Werner, Boehringer Ingelheim GmbH/D	
10:00	Coffee break	
Room 43	Hall 7	
Functional materials Nano	Particle technology Fluidisation	
Chair:	K.-E. Wirth, University of Erlangen-Nuremberg/D	
10:30	Non-contact energy input in a fluidised bed A. Stresing, L. Mörl, University of Magdeburg/D; M. Jacob, Glatt Ingenieurtechnik GmbH, Weimar/D; K. Walther, EMA-TEC GmbH, Sondershausen/D	
11:00	Aggregative behaviour in gas fluidisation of mechanically vibrated cohesive powders D. Barletta, M. Poletto, University of Salerno, Fisciano/I	
11:30	TANDEM LECTURE Multi-scale simulation approach for the fluidised bed spray granulation process S. Heinrich, TU Hamburg-Harburg/D; J.A.M. Kuipers, TU Eindhoven/NL	
12:00	Synthesis of silver nanoparticles in melts of amphiphilic polyesters for antimicrobial applications S. Vasylyev, C. Damm, W. Peukert, University of Erlangen-Nuremberg/D	
12:30	Lunchtime	
Functional materials Polymer	Particle technology Particles and interfaces	
Chair:	U. Teipel, Ohm University of Applied Sciences, Nuremberg/D	
13:30	Applications of particle modifications in plasma systems C. Roth, G. Oberbossel, A. Sonnenfeld, P. Rudolf von Rohr, ETH Zurich/CH	
14:00	Surface functionalisation of MgO nanocubes: from a model system to an optical material A. Sternig, O. Diwald, University of Erlangen-Nuremberg/D; S. Stankic, F. Finocchi, INSP, Paris/F; J. Bernardi, TU Vienna/A	
14:30	Surface modification of SiO ₂ nanoparticles from the gas-phase for industrial applications Y.H. Sehlleier, T. Huelsner, IUTA – Institut für Energie und Umwelttechnik e.V., Duisburg/D; A. Abdali, H. Wiggers, C. Schulz, University of Duisburg-Essen/D	
15:00	Supercritical route for super hybrid nanomaterials T. Adschiri, Tohoku University, Sendai/J	
	Coffee break	
Particle technology Powder flow		
Chair:	M. Poletto, University of Salerno/I	
16:00	Determination of the macroscopic cohesion of fine powders by the rain-off experiment R. Girimonte, B. Formisani, University of Calabria/I; G. Calvert, M. Ghadiri, University of Leeds/UK	
16:30	Improvement of flowability of fine cohesive powders by flow additives S. Kleinschmidt, J. Tomas, University of Magdeburg/D	
17:00	A new shear-elongation mixing laboratory preparation of polymer nano-composites H. Benkreira, A. Khan, R. Patel, University of Bradford/UK	

Hall 1		
PLENARY LECTURE		
Chair:	K. Wagemann, DECHEMA e.V., Frankfurt/D	
09:00	Biopharmaceutical process development: the shortcut to the market R.G. Werner, Boehringer Ingelheim GmbH/D	
10:00	Coffee break	
Salon 15/16	Roofgarden	
Assessment of processes sustainability Sustainability assessment of processes	Product design and engineering Simulation of particle formation	
Chair:	J. Uhlemann, Bayer Technology Services GmbH, Leverkusen/D	
10:30	Analysis of parameter settings for a PCA-based method supporting sustainable decision making in early stages of process design S. Papadokonstantakis, A. Banimostafa, K. Hungerbühler, ETH Zurich/CH	
11:00	Exergetic evaluation of biobased synthesis pathways P. Frenzel, S. Fayyaz, R. Hillerbrand, A. Pfennig, RWTH Aachen/D	
11:30	KEYNOTE LECTURE Evaluating process sustainability using flowsheet monitoring W. Barretti, Environmental Protection Agency, Cincinnati, OH/USA; J. van Baten, AmsterCHEM, Almeria/E	
12:30	Lunchtime	
Carbon capture New absorbents for carbon capture	Product design and engineering Product design based on drying processes	
Chair:	U. Bröckel, University of Applied Sciences Trier/D	
13:30	Design of enhanced carbon dioxide absorption process using immobilised amines Y. Algaver, M. Grünwald, T. Fieback, University of Bochum/D; U. Kunz, TU Clausthal/D	
14:00	New washing fluids for CO ₂ capture: data estimation and process simulation using hyperbranched polymers W. Martini, R. Kühn, F. Roske, H. Arellano-García, G. Wozny, TU Berlin/D	
14:30	Thermomorphic biphasic solvent for reducing the cost of post-combustion CO ₂ capture J. Zhang, R. Misch, D.W. Agar, TU Dortmund/D	
15:00	Coffee break	
Carbon capture Capture of CO ₂ by adsorption technologies	Product design and engineering Product design in life science	
Chair:	W. Meier, DECHEMA e.V., Frankfurt/D	
16:00	Pre-combustion CO ₂ capture by pressure swing adsorption J. Schell, N. Casas, L. Joss, ETH Zurich/CH; R. Blom, SINTEF, Oslo/N; M. Mazzotti, ETH Zurich/CH	
16:30	Hydrogen production integrated with simultaneous CO ₂ sequestration on fly ashes from power plants E. Molga, R. Cherbanski, TU Warsaw/PL	
17:00	Enzyme immobilisation on porous particles by means of the Layer-by-Layer technology L. Dähne, G. Egri, Surflay Nanotec GmbH, Berlin/D; P. Bubenheim, A. Hagedorn, TU Hamburg-Harburg/D; U. Sohling, F. Ruf, Süd-Chemie AG, Moosburg/D	
	Formulation of β-carotene by precipitation from pressurised ethyl acetate-on-water emulsions for application as natural colorant E. De Paz, A. Martín, M.J. Cocero, University of Valladolid/E	
	Mixed biopolymer particles providing new low-fat-milk products: processing and structure A. Krzeminski, J. Hinrichs, University of Hohenheim, Stuttgart/D	

Prediction of the Dynamics of Gel Formation in Superabsorbent Polymer Synthesis

Miguel Gonçalves,¹ Virgínia Pinto,¹ Rolando Dias,¹ Mário Rui Costa²

¹LSRE-Polytechnic Institute of Bragança, Portugal, Email: rdias@ipb.pt

²LSRE-FEUP, Porto, Portugal, Email: mrcosta@fe.up.pt

Superabsorbent polymers (SAP) are able to retain up to 1000 g/g of water relatively to dry weight. As consequence, these materials find important applications in different fields such as sanitary industries, agriculture, environment, construction or controlled release.^[1] This work reports experimental and theoretical studies concerning SAP production through the copolymerization of acrylic acid with N,N'-methylenebisacrylamide (bifunctional crosslinker) or trimethylolpropane triacrylate (trifunctional crosslinker). In such way, the influence of the functionality of the crosslinker on the dynamics of gel formation is assessed. Polymerizations are performed in a 2.5 L batch reactor considering solution and inverse suspension operation. An *in-line* FTIR-ATR immersion probe is used to monitor these reactions. Soluble fraction of samples collected at different reaction time are *off-line* analyzed using size exclusion chromatography with refractive index and multi-angle laser light scattering detection (SEC/RI/MALLS). Dynamics of weight fraction of gel is also measured and key properties of SAP production are thus experimentally obtained. Experimental measurements are compared with predictions of a general kinetic approach^[2-4] that allows the quantification of the post-gelation period. The Theory of Branching Processes (TBP) is also used to describe these non-linear polymerizations and important differences between the two theoretical approaches are identified. These modeling studies can be useful to design operation conditions leading to improved superabsorbent networks.

[1] F.L. Buchholz, A.T. Graham, *Modern Superabsorbent Polymer Technology*, Wiley-VCH, New York, 1998.

[2] M.R.P.F.N. Costa, R.C.S. Dias, *Chem. Eng. Sci.* 2005, 60, 423.

[3] R.C.S. Dias, M.R.P.F.N. Costa, *Polymer* 2006, 47, 6895.

[4] M.R.P.F.N. Costa, R.C.S. Dias, *Polymer* 2007, 48, 1785.