DECHEMA

VDI

BOOK OF ABSTRACTS

18 – 20 July 2022
Congress Center Würzburg/Germany

Annual Meeting on Reaction Engineering and ProcessNet Subject Division Heat and Mass Transfer 2022

www.dechema.de/react_hmt_2022

PROCESSNET
EINE INITIATIVE VON DECHEMA UND VDI-GVC

PROGRAMME AT A GLANCE

Monday, 18 July 2022

12:00	Registration and Lunch	
	Franconia Hall	
	Chair: Sauer	
13:00	*WELCOME ADDRESS* Sauer & Scholl	
13:10	*PLENARY LECTURE* Prof. Shantanu Roy	
14:00	Bracconi	
14:25	Kutscherauer	
14:50	COFFEE BREAK IN EXHIBITION AREA	
	Chair: Scholl	
15:20	Welzel	
15:45	Quarz	
16:10	Appelhaus	
	Franconia Hall	**Room 5 & 6**
16:35-16:45	*Short Presentations of the Research Fellow*	*Short Poster Presentations Heat and Mass Transfer*
16:45-17:00	*Short Presentations of the Exhibitors*	
17:00-17:15	*Short Introduction of Poster Programme*	
17:15-20:00	*Poster Party in Exhibition Area*	
20:00-22:00	*NaWuRet Get together*	

Tuesday, 19 July 2022

	Franconia Hall	
	Chair: Krewer	
09:00	*PLENARY LECTURE* Prof. Elias Klemm	
09:50	ROOM CHANGE	
	Franconia Hall	**Room 5 & 6**
	Electrification	*Fouling*
	Chair: Krewer	Chair: Sommerfeld
09:55	Löffelholz	Schumacher
10:20	Matthies	Jarmatz
10:45	COFFEE BREAK IN EXHIBITION AREA	
	Modelling & Reactor Design	*Transport properties*
	Chair: Freund	Chair: Wetzel
11:15	Ambrosetti	Rodrigues
11:40	Brune	O´Neill
12:05	Semmel	Bravo
12:30	Zimmermann	Schmidt
12:55	LUNCH BREAK IN EXHIBITION AREA	
	Reactor Diagnostics	*Evaporation*
	Chair: Zanthoff	Chair: Schnabel
14:00	Buchholz	Deeb
14:25	Korup	Steiner
14:50	Güttel	Laube
15:15	COFFEE BREAK	
	Franconia Hall	
	Chair: Scholl	
15:45	*PLENARY LECTURE* Prof. Peter Stephan	
16:35	*Poster Discussions*	
	Franconia Hall	**Room 5 & 6**
17:30-18:45	*General Assembly of the Working Group Reaction Engineering* (Mitgliederversammlung der Fachgruppe Reaktionstechnik)	*Advisory Board Meeting of Subject Division Heat & Mass Transfer* (Beiratssitzung der Fachgruppe Wärme- und Stoffübertragung)
19:00-23:00	*Conference Dinner*	

PROGRAMME AT A GLANCE

Wednesday, 20 July 2022

	Franconia Hall	Room 5 & 6
	Novel Processes	*Equipment Characterization*
	Chair: Agar	Chair: Hammerschmidt
09:00	*Awarding and Lecture of the winner of „Hanns-Hofmann-Prize“*	Will
09:25	Medicus	Schiffer
09:50	Ruede	Heckmann
10:15	Himmelmann	Faden
10:40	COFFEE BREAK IN EXHIBITION AREA	
	Kinetics	*Condensation*
	Chair: Turek	Chair: Jasch
11:10	Kreitz	Losher
11:35	Kuhn	Buckmann
12:00	Röse	Zimmermann
12:25	ROOM CHANGE	
	Franconia Hall	
	Chair: Krewer	
12:30	*PLENARY LECTURE* Prof. Siegfried Waldvogel	
13:15	*Poster Awards & Young Talent Award*	
13:30	*Closing* Wachsen, Sommerfeld	
13:45	End of Meeting and Lunch	

Evaluating the shape of input perturbation for forced periodic operation

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Continuous chemical processes are typically designed to operate under steady state conditions. However, there is strong evidence that an optimized forced periodic operation possesses the potential to improve process performance [1]. More demonstration examples are needed to promote such advanced concepts.

In this contribution we will present results for two case studies. The first reaction investigated is the liquid phase hydrolysis of acetic anhydride performed in an adiabatic continuous stirred tank reactor (CSTR). The second examples is the heterogeneously catalysed gas phase synthesis of methanol performed in an isothermal and isobaric CSTR. Our theoretical analysis exploits independently determined kinetic models of these reactions [2, 3]. Besides performing numerical process simulations the Nonlinear Frequency Response (NFR) method [4] is used. The magnitude of possible process improvements depends on the applied strategy of forced periodic operation. Besides the input to be perturbed (concentration, flowrate, temperature, …), the forcing frequency and the forcing amplitude as well as the shape of the input modulation are of relevance. In this contribution we will compare the input modulated as harmonic (Fig 1*a*) and as a square wave function (“bang-bang”, Fig 1*b*). In order to use the NFR method for the latter input function an approximation via Fourier series is applied [5, 6]. The results reveal improvements of easier to practically implement square wave inputs for both examples considered, compared to harmonic modulation of inputs [5, 6].

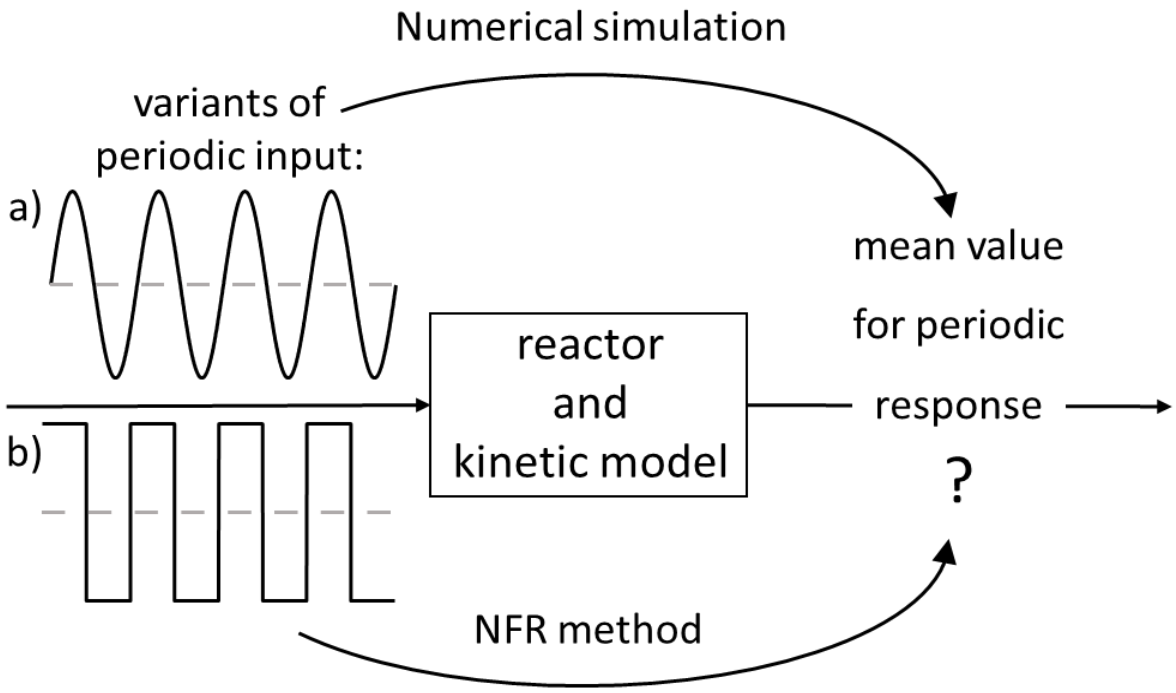

Figure 1: principle of forced periodic operation (2 types of input functions)

[1] P.L. Silveston, R.R. Hudgins (Eds.), Periodic operation of reactors, Elsevier, **2013**.

[2] M. Felischak, L. Kaps, C. Hamel, D. Nikolic, M. Petkovska, A. Seidel-Morgenstern, Chemical Engineering Journal **2021**, 410, 128197. DOI: 10.1016/j.cej.2020.128197.

[3] C. Seidel, A. Jörke, B. Vollbrecht, A. Seidel-Morgenstern, A. Kienle, Chemical Engineering Science **2018**, 175, 130-138. DOI: 10.1016/j.ces.2017.09.043.

[4] M. Petkovska, D. Nikolić, A. Seidel-Morgenstern, Israel Journal of Chemistry **2018**, 58.6-7, 663-681.

[5] D. Nikolić, M. Petkovska, Chemie Ingenieur Technik **2016**, 88 (11), 1715–1722. DOI: 10.1002/cite.201600060.

[6] D. Nikolić, A. Seidel-Morgenstern, M. Petkovska, Chemical Engineering Science **2020**, 226, 115842. DOI: 10.1016/j.ces.2020.115842.

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