

WILHELM UND ELSE HERAEUS-STIFTUNG



International WE-Heraeus Physics School on

Model systems for understanding biological processes

22 – 27 February 2015
at the Physikzentrum Bad Honnef (Germany)

Program

Tuesday, 24 February 2015

08:00	BREAKFAST	
09:15 – 10:00	Hanspeter Herzel	The circadian clock – a system of coupled oscillators (part 2)
10:00 – 10:45	Arkady Pikovsky	Synchronization in ensembles of oscillators: Theory of collective dynamics
10:45 – 11:15	COFFEE BREAK	
11:15 – 12:00	Katharina Krischer	Pattern recognition with weakly coupled oscillatory networks
12:00 – 12:45	Marcus Hauser	Excitable media: Self-organisation in three-dimensional systems
12:45	LUNCH	
14:15 – 15:00	Markus Bär	Pattern formation in active biological matter (part 2)
15:00 – 15:45	Stefan Klumpp	Physical forces in bacterial motility (part 1)
15:45 – 16:15	COFFEE BREAK	
16:15 – 17:00	Karsten Kruse	Actin polymerization waves and actin-based motility
17:00 – 17:45	Alexander Mikailov	Simple elastic models of protein machines and synthetic motors (part 1)
18:00	DINNER	

Abstracts of Posters

(in alphabetical order)

Pattern formation induced by propagating precipitation fronts

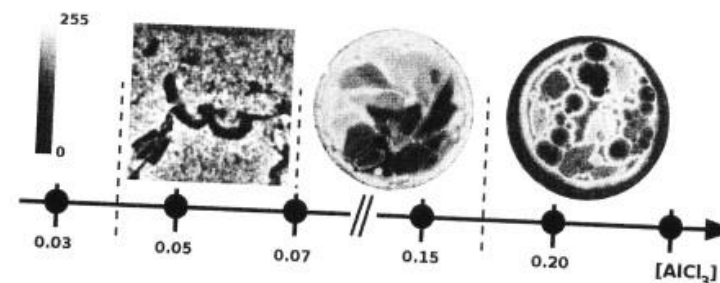
Brigitta Dúzs

*Institute of Chemistry, Eötvös University, Budapest, Hungary
E-mail: duzsbrigitta@gmail.com*

Precipitation processes are essential in many natural systems, especially in biomineralization and in geological pattern formation.

I have observed temporal oscillations in the total mass of the precipitate, the formation of propagating and annihilating waves, and morphological instabilities in a thin precipitation layer in a two-side-fed gel reactor containing the $\text{AlCl}_3/\text{NaOH}$ reaction-diffusion system (redissolution occurs due to complex formation with common ions). [1] Contrary to the standard Liesegang patterns, this precipitation pattern formation has been observed along the lateral direction, perpendicular to the diffusion flux, at the meeting of the counterpropagating diffusion fronts of the electrolytes. Depending on the concentration of aluminum-ions, I have observed three different dynamical scenarios.

1. Periodic precipitation-redissolution fronts ("oscillation")
2. Propagating precipitation waves ("excitability")
3. Dendritic patterns due to lateral front instabilities



The two main ingredients of the system are the amphoteric precipitate and the cross gradient of the chemicals due to the fixed boundary conditions. Simulations with a four-variable precipitation/redissolution model qualitatively reproduce the oscillations in the total mass of the precipitate and point out the stratified three-dimensional structure of the precipitate.

References

- [1] Brigitta Dúzs, István Lagzi, István Szalai, *Langmuir* **30**, 5460–5465 (2014)

Participants

Dr. Ernst Dreisigacker

Wilhelm und Else Heraeus-Stiftung
Hanau, Germany

dreisigacker@we-heraeus-stiftung.de

Setareh Dolati

Max-Delbrück-Centrum
Berlin, Germany

Setareh.Dolati@mdc-berlin.de

Brigitta Dúzs

Eötvös Loránd University
Department of Analytical Chemistry
Budapest, Hungary

duzsbrigitta@gmail.com

Prof. Harald Engel

Technische Universität Berlin
Institut für Theoretische Physik
Berlin, Germany

h.engel@physik.tu-berlin.de

Prof. Martin Falcke

Max-Delbrück-Centrum
Mathematische Zellphysiologie
Berlin, Germany

martin.falcke@mdc-berlin.de

Dr. Matthias Gerhardt

Universität Potsdam
Institut für Physik und Astronomie
Potsdam Golm, Germany

matthias.gerhardt@uni-potsdam.de

P. M. Gokul

Technical University of Lodz
Division of Dynamics
Lodz, Poland

gokulnappu@gmail.com

PD Dr. Albert Goldbeter

Université Libre de Bruxelles (ULB)
Faculty of Sciences
Brussels, Belgium

agoldbet@ulb.ac.be

Robert Großmann

Physikalisch-Technische Bundesanstalt
Department 8.41
Berlin, Germany

grossmann@physik.hu-berlin.de