

# BOOK OF ABSTRACTS



3RD INTERNATIONAL CONFERENCE  
ON REACTION KINETICS, MECHANISMS  
AND CATALYSIS

22-25 MAY 2024  
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**RKMC**  
**3rd International Conference on Reaction Kinetics,  
Mechanisms and Catalysis**

**22–25 May 2024**  
**Budapest, Hungary**

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## Catalytic-like effect of alternating electric field on the growth and germination of wheat seeds

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The biological effect of electric, magnetic or electromagnetic fields on eukaryote and prokaryote has awakened strong interests of biologists since mentioned physical fields could act as stress factors and thus affect the metabolism, behaviour and survival of cells [1]. Moreover increasing interest can be noted in a search of production technologies based on physical treatments of seeds which could substitute or improve conventional methods, mostly including usage of harmful fertilizers. Our previous experimental results performed on yeast cells indicated statistically significant effects on the metabolism of yeast cells by application of microwave irradiation [2] and low-frequency magnetic fields [3], but because both techniques are not easily scalable to larger volumes, we wanted to develop a more economy and user-friendly experiments in order to study effects of alternating electric field (AEF). In comparison to our previous studies performed on yeast cells, in the present research the influence of AEF was examined on one of the most important cereals used in human nutrition that is wheat.

In this preliminary experimental study wheat seed samples were treated with AEF (in the frequency range up to 1 MHz). Obtained results suggest that AEF used in this research may enhance seed germination and its growth. Besides this catalytic-like effect, statistically significant differences were observed in important photosynthetic pigments such as chlorophyll a and b as well as in total chlorophyll content in wheat leaves, while carotenoid pigments showed statistically insignificant differences between control and AEF treated samples. Also some of the most commonly used vegetation indices used to monitor plant health, such as Normalized Difference Vegetation Index and Greenness Index also showed statistical significant differences between control and seeds treated with AEF. Even though future experimental research is needed to optimize the experimental conditions as well as to confirm observed effects, we believe that AEF effects in pre-sowing seed treatment may have a great potential for agricultural production in future or even to potentially improve phytoremediation processes.

### Acknowledgments

This research was supported by the Science Fund of the Republic of Serbia, Grant No 6684, *Phytoremediation for in situ treatment of agricultural soil and surface waters polluted with per- and polyfluoroalkyl substances - research on PFOS and PFOA as model compounds* - PhytoPFAS.

**References**

1. W. Fan, Z. Huang, B. Fan, *Microb. Pathog.* **115** (2018) 117–122.
2. D. Stanisavljev, G. Gojgić-Cvijović, I. N. Bujanja, *Eur. Biophys. J.* **46**(1) (2017) 25–31.
3. I. N. Bujanja, B. Lončarević, M. Lješević, V. Beškoski, G. Gojgić-Cvijović, Z. Velikić, D. Stanisavljev, *Chem. Eng. Process.* **143** (2019) 107593.

### 3rd International Conference on Reaction Kinetics, Mechanisms and Catalysis

RKMC 2024

22-25 May 2024 / Budapest, Hungary / Mercure Budapest Castle Hill \*\*\*\*

#### Programme\*

#### Wednesday / 22 May 2024

15:00	Registration desk opens			
<b>Room Mátyás I.</b>				
17:00	17:10	Opening remarks	Gábor Lente	Conference Chair University of Pécs, Hungary
<b>Chair: Gábor Lente</b>				
17:10	18:15	Reaction-diffusion modelling and applications of autocatalytic systems: recent developments + 15 min. Q&A	Annette F. Taylor	University of Sheffield, UK
18:15	20:00	Welcome reception (Foyer)		

#### Thursday / 23 May 2024

<b>Room Mátyás I.</b>				
<b>Chair: Günther Rupprechter</b>				
9:00	9:50	Electrocatalytic refinery for production of fuels and chemicals + 10 min. Q&A	Shizhang Qiao	University of Adelaide, Australia
9:50	10:15	Computational profiling of fast, base-free synthesis of quinolin-2-(1H)-one + 5 min. Q&A	Krishna K. Govender	University of Johannesburg, South Africa
10:15	10:40	Biochar-derived activated carbons: a comprehensive assessment of kinetic and isotherm modeling for adsorptive removal of methylene blue dye contaminants + 5 min. Q&A	Othman M. Hakami	Jazan University, Saudi Arabia
10:40	11:10	Coffee break (Foyer)		
<b>Chair: Shizhang Qiao</b>				
11:10	11:35	Catalytic glycerol hydrogenolysis on bimetallic clusters of platinum and tungsten: A DFT study + 5 min. Q&A	Mohit Kashyap	IITB-Monash Research Academy, India
11:35	12:00	Small molecule activation at biological metal-macrocycle complexes: contrasts between heme and vitamin B12 + 5. min. Q&A	Radu Silaghi-Dumitrescu	Babes-Bolyai University, Romania
12:00	12:25	Magnetic field control of heterogeneous catalysis: Application to low-pressure Fischer-Tropsch + 5 min. Q&A	Durante' E Naidoo	University of KwaZulu-Natal, South Africa
12:30	14:00	Lunch (Restaurant)		
14:00	16:00	Poster session (Room Mátyás II.)		
16:00	16:30	Coffee break (Foyer)		
17:00	19:00	Walking tour in the Buda Castle district Meeting point: Registration desk 17:00		

#### Friday / 24 May 2024

<b>Room Mátyás I.</b>				
<b>Chair: Zeljko Cupic</b>				
9:00	9:50	Chemical dynamics in single particle catalysis: in situ microscopy and microkinetic modelling + 10 min. Q&A	Günther Rupprechter	TU Wien, Austria
9:50	10:15	Mechanism reduction-assisted kinetic parameter optimization for combustion mechanisms + 5. min. Q&A	László Horváth	HUN-REN Centre for Natural Sciences, Hungary
10:15	10:40	VOC oxidation over structured transition metal oxide catalysts prepared by plasma jet sputtering: the effect of energy delivery + 5 min. Q&A	Pavel Topka	Institute of Chemical Process Fundamentals of the CAS, Czech Republic
10:40	11:10	Coffee break (Foyer)		
<b>Room Mátyás I.</b>				
<b>Chair: Ana Ivanović-Šašić</b>				
11:10	11:35	Triglyceride hydroconversion over alumina-supported and phosphatized-alumina-supported Pd catalysts + 5 min. Q&A	Anna Vikár	HUN-REN Research Centre for Natural Sciences, Hungary
11:35	12:00	Heterogeneous catalyst development and reaction kinetics for biodiesel production from biomass-based sources + 5. min. Q&A	Raphael Idem	University of Regina, Canada
12:00	12:25	Hydroconversion of $\gamma$ -valerolactone on alumina- and Beta zeolite-supported Co catalysts: The role of catalyst acidity in the reaction pathways + 5 min. Q&A	Hanna E. Solt	HUN-REN Research Centre for Natural Sciences, Hungary
12:30	14:00	Lunch (Restaurant)		
<b>Room Mátyás I</b>				
<b>Chair: András Sápi</b>				
14:00	14:25	Photocatalytic characteristics of (Ag,Na)-TiO <sub>2</sub> /Sr <sub>4</sub> Al <sub>14</sub> O <sub>25</sub> :Eu,Dy heterojunction photocatalyst synthesized by coprecipitation method + 5 min. Q&A	Jung-Sik Kim	University of Seoul, South Korea
14:25	14:50	PNC-doped TiO <sub>2</sub> nanoparticles for highly stable self-cleaning paints: A sustainable path to industrial development+ 5. min. Q&A	Qaisar Maqbool	TU Wien, Austria
14:50	15:15	Plasmon-enhanced ammonia photoelectrosynthesis + 5 min. Q&A	Vitor Silveira	Uppsala University, Sweden
15:15	15:40	Rooibos tea waste binary oxide composite: An adsorbent for the removal of nickel ions and an efficient photocatalyst for the degradation of ciprofloxacin + 5 min. Q&A	Kriveshini Pillay	University of Johannesburg, South Africa
19:00	22:00	Conference dinner - Stadt Wien boat Meeting point: Registration desk 18:30		

#### Saturday / 25 May 2024

<b>Room Mátyás I.</b>				
<b>Chair: Annette F. Taylor</b>				
9:00	9:50	Perturbation techniques in experimental and numerical investigations of the Belousov-Zhabotinsky oscillatory reaction + 10 min. Q&A	Ana Ivanović-Šašić	University of Belgrade, Serbia
9:50	10:15	Deactivating effects in the co-conversion of lauric acid and anisol over NiMo/Al <sub>2</sub> O <sub>3</sub> catalyst + 5. min. Q&A	Oleg Kikhtyanin	University of Chemistry and Technology Prague, Czech Republic
10:15	10:40	Polymorph selection of zeolitic imidazolate frameworks via kinetic and thermodynamic control + 5 min. Q&A	Gábor Schuszter	University of Szeged, Hungary
10:40	11:10	Coffee break (Foyer)		
<b>Room Mátyás I.</b>				
<b>Chair: Gábor Lente</b>				
11:10	11:35	Femtosecond laser generation of defect-rich CuZn nanoalloys for model catalysis + 5 min. Q&A	Niusha Lasemi	TU Wien, Austria
11:35	12:00	Tuning quality of C1 and C5+ green fuels by CO <sub>2</sub> hydrogenation over structured catalysts + 5. min. Q&A	András Sápi	University of Szeged, Hungary
12:00	12:25	Structure of the slow manifold as a tool for parametrisation of the reaction mechanism for oscillatory reactions + 5 min. Q&A	Zeljko Cupic	University of Belgrade, Serbia
12:25	12:40	Closing remarks	Gábor Lente	Conference Chair University of Pécs, Hungary
12:40	14:00	Lunch (Restaurant)		

#### Poster session / Thursday, 23 May 2024 / 14:00-16:00 / Room Mátyás II.

<b>T1 Catalysts in sustainable and green chemistry</b>				
Catalytic-like effect of alternating electric field on the growth and germination of wheat seeds	Itana Nuša M. Bubanja	University of Belgrade, Serbia		
Effect of calcination temperature on the activity of K-Co/Al <sub>2</sub> O <sub>3</sub> catalyst for oxidative coupling of methane	Sarannuch Sringam	Kasetsart University, Thailand		
Hydrogen sulfide removal using Copper (II) nitrate-impregnated ZSM-5 derived from sugarcane bagasse ash	Napassorn Chanka	Kasetsart University, Thailand		
Palladium-catalysed hydroaminocarbonylation of olefins with aliphatic amines without additives	Fanni Bede	University of Pécs, Hungary		
<b>T2 Catalytic solutions for energy-related challenges</b>				
Development of catalysts for the catalytic hydrogenation of aromatic nitro compounds for industry	Andra Mihalkó	BorsodChem Zrt., Hungary		
Extrusion of optimized catalysts with smart extrusion technology from ECT-KEMA	Torsten Seidel	ECT-Kema GmbH, Germany		
Synthesis, characterization and application of Fe-SBA-15 catalyst	Darja Pečar	University of Maribor, Slovenia		
<b>T5 Homogeneous and heterogeneous photocatalysis</b>				
Photochemical processes in aqueous benzoquinone and anthraquinone solutions	Krisztina Csonka	University of Pécs, Hungary		
Photochemical study of the reaction between 2,3-dimethoxy-5-methyl-p-benzoquinone and water	Erik Imre	University of Pécs, Hungary		
Photochemical decomposition of sodium anthraquinone-sulfonate in aqueous solution	Panna Lukács	University of Pécs, Hungary		
A kinetic study of the photooxidation of water by aqueous cerium(IV) in perchloric and nitric acids	Ildikó Rapp-Kindner	University of Pécs, Hungary		
<b>T6 Catalysts in biomass utilization</b>				
Ethanol coupling reactions over noble metal (Pt, Pd) promoted MgO-Al <sub>2</sub> O <sub>3</sub> mixed oxide-based catalysts	Amosi Makoye Shitebel	HUN-REN Research Centre for Natural Sciences, Hungary		
<b>T7 Mathematical aspects of reaction kinetics</b>				
Modeling of thiol waves in two-channel gel reactors	István Sütő	University of Szeged, Hungary		
The kinetics of a generalized nucleation-growth type model	Rebeka Szabó	University of Pécs, Hungary		
Stationary distribution control of a gene regulation network using compartmental discretization	Gábor Szederkényi	Pázmány Péter Catholic University, Hungary		
Examples for non-autonomous pH-oscillation systems and applications	Norbert Német	Budapest University of Technology and Economics, Hungary		
<b>T8 Electrocatalysis, electrode development and fuel cells</b>				
Two-dimensional electrochemical imaging of the Belousov-Zhabotinsky reaction using a microelectrode	András Kiss	University of Pécs, Hungary		
<b>T10 Catalysts in the hydrogen economy</b>				
Cobalt supported on a mesoporous TiO <sub>2</sub> for Fischer-Tropsch reaction	Alfonso Caballero	University of Seville, Spain		
The Computational screening of van Der Waals heterostructures as sustainable hydrogen production materials	Poomani Govender	University of Johannesburg, South Africa		
Analysis of safe operation characteristics of SOFC pre-reformer with integrated heat exchanger	Tak-Hyoung Lim	Korea Institute of Energy Research, South Korea		
In search of oxo-rhenium catalyst compositions for development of an active new formulation for one-step water-gas shift reaction	Dimitrinka Nikolova	Institute of Catalysis, Bulgarian Academy of Sciences, Bulgaria		
Dehydrogenation of methyl cyclohexane over nickel-ceria-alumina LOHC catalysts	Yuting Shi	HUN-REN Research Centre for Natural Sciences, Hungary		
Solar photocatalytic water splitting for hydrogen generation using a novel chromium-doped SrTiO <sub>3</sub> integrated MXene nanocomposite	Héctor Valdés	Universidad Católica de la Santísima Concepción, Chile		

\*The Organizers reserve the right to make changes in the Conference programme