C123
VALORISING METHANE RESOURCES

Newsletter

C123 – Methane oxidative conversion and hydroformylation to propylene

No. 4, December2022

C123 conference contributions

The C123 project was profiled at several conferences.

The first lecture was given at the Netherlands' catalysis and chemistry conference (NCCC). The lecture had the topic 'Oxidative Coupling of Methane in CO_2 containing feeds' given by Yonggang Cheng from UGent. In this lecture promising results were presented. Based on experimental investigations, it is believed that NaMnW/SiO_2 is a more promising catalyst for OCoM process in comparison with La-Sr/CaO. Other OCM catalysts with less CO_2 absorption ability will also be considered as potential OCoM catalysts.

The second oral contribution was presented in the 17th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES) in Paphos (Cyprus). This conference was dedicated to the advancement and dissemination of knowledge on methods, policies and technologies for increasing the sustainability of development by de-coupling growth from the use of natural resources and by a transition to a knowledge-based economy. The lecture had the topic 'Environmental assessment of propanol production from unconventional methane sources' given by Jordy Motte from UGent.

Picture 1: Jordy Motte (UGent) presenting this research at SDEWES.

The third lecture was given by Sevinj Osmanova from ANAS at the international conference: modern problems of theoretical and experimental chemistry dedicated to the 90th anniversary of honored scientist Rafiga Aliyeva in Azerbaijan. The lecture was entitled 'Morphology and distribution of active elements in $MnNaW/SiO_2$ catalysts for oxidative conversion of methane'.

The fourth lecture, entitled 'Microkinetic analysis of ethylene hydroformylation on a heterogeneous Rh modified MOF catalyst', was presented on the Chemistry Conference for Young Scientist (CRF-ChemCYS) in Blankenberge (Belgium). This lecture was presented by Sébastien Siradze from UGent.

The fifth lecture, entitled 'New Insights into the Effect of CO2 on Oxidative Coupling of Methane (OCM)' was presented on the AIChE annual meeting 2022 in Phoenix (US). This lecture was presented by Joris Thybaut from UGent.

Some more contributions are expected in 2023 such as oral contributions at ISCRE27, NAM-28 and EUROPACAT2023.

In addition to these lectures, the C123 project presented 7 posters at different conferences.

The first poster was at the 26th International Symposium on Chemical Reaction Engineering (ISCRE26) held on December 5-8 2021. The topic was 'Top-down kinetic modeling: a transient solution strategy applied to methane steam reforming in a plug flow reactor'. The authors of this poster were Joris Thybaut, Jeroen Poissonier, Ana Rita Costa Da Cruz and Sébastien Siradze from Ghent University.

The second poster was at the first Chemical Technology Symposium held on December 21 2021 in Ghent. The topic was 'Microkinetic analysis of ethylene hydroformylation'.The authors of this poster were Joris Thybaut, Jeroen Poissonier, Ana Rita Costa Da Cruz and Sébastien Siradze from Ghent University.

The third poster was at the third edition of the French Conference on Catalysis (FCCat 2022). The topic was 'Single catalytic extrudate reactor for kinetic studies of the oxidative coupling of biogas'.The authors of this poster were Valentin L'Hospital , Jordan Guillemot, Thomas Michon, Yves Schuurman and David Farrusseng from CNRS.

The fourth poster was at the YOURHETCAT2022 conference in Szeged (Hungary). The topic was 'Effect of Reaction Temperature on the Surface Structure and Phase Composition of MnO_x-Na_2WO_4/SiO_2 Catalyst for Oxidative Conversion of Methane'. The authors of this poster were Sevinj Osmanova, Etibar Ismailov, Dilgam Taghiyev from ANAS and Joris Thybaut from Ghent University.

The fifth contribution was an online participation at the International Scientific and Technical Conference of Young Scientists "Innovation Materials and Technologies" in Minsk (Republic of Belarus) by the team of Etibar Ismailov. The topic was 'Effect of reactıon mıxture on phase composıtıon and magnetıc propertıes of $MnNaW/SiO_2$ catalyst for oxidatıve conversıon of methane'.

The sixth poster was presented at the Chemistry Conference for Young Scientists (CRF-ChemCYS) in Blankenberge (Belgium). The topic was 'Reactions of Free Radicals in Catalytic Oxidative Conversion of Methane Based on in situ EPR/MS Data'. The authors of this poster were Sevinj Osmanova, Etibar Ismailov, Dilgam Taghiyev from ANAS and Joris Thybaut from Ghent University.

The seventh poster was presented at the Ukrainian conference with international participation "CHEMISTRY, PHYSICS AND TECHNOLOGY OF SURFACE" on 19 and 20 October, 2022 in Kyiv. The topic was 'Structure and Stability of MnO_x-Na_2WO_4/SiO_2 Catalyst for Oxidative Conversion of Methane'. The authors of this poster were Sevinj Osmanova, Gunel Azimova, Sima Zulfugarova, Etibar Ismailov, Dilgam Taghiyev from ANAS and Joris Thybaut from Ghent University.

A White paper on circular economy for hydrocarbons will be published by UGent (Alejandro Romero Limones) in 2023. This White paper will contain an introduction to the issue of methane valorization. Next, a historical evolution of existing technologies will be described such as TOPCOMBI, OCMOL, MEMERE,…. Followed by a description of the recent evolutions in the area (C123, sister projects in Europe: ZeoCat-3D, BiZeolCat, parallel projects across the globe: CISTAR,…). Finally, the expectations and the vision for future developments/research will be given.

C123 publications

Four new manuscripts were published in 2022.

The fourth publication of the C123 project has been published in *Environmental Pollution by UGent*. This manuscript, highlighting the global and regional impacts of gas flaring, is entitled "Quantification of the global and regional impacts of gas flaring on human health via spatial differentiation", and can be accessed at https://doi.org/10.1016/j.envpol.2021.118213.

Environmental Pollution
Volume 291, 15 December 2021, 118213

Quantification of the global and regional impacts of gas flaring on human health via spatial differentiation ☆

Jordy Motte [a], Rodrigo A.F. Alvarenga [a], Joris W. Thybaut [b], Jo Dewulf [a]

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https://doi.org/10.1016/j.envpol.2021.118213

The fifth manuscript from the group of E.H. Ismailov and J.W. Thybaut, describing the phases present on the catalyst and their mutual interaction as well as with the reactants and products during OCoM

is entitled “Phase composition and catalytic properties of MnNaW/SiO2 oxide system in oxidative conversion of methane”, and can be accessed at https://doi.org/10.1007/s11237-022-09723-8. It is published in Theoretical and Experimental Chemistry.

Published: 02 June 2022

Phase Composition and Catalytic Properties of $MnNaW/SiO_2$ Oxide System in Oxidative Conversion of Methane

E. H. Ismailov, D. B. Taghiyev, S. M. Zulfugarova, S. N. Osmanova, G. R. Azimova & J. W. Thybaut

Theoretical and Experimental Chemistry **58**, 61–69 (2022) | Cite this article

A sixth C123 publication has been published in the journal *Journal of Cleaner Production*. The manuscript 'Developing circularity, renewability and efficiency indicators for sustainable resource management: propanol production as a showcase' by Jordy Motte, Pieter Nachtergaele, Mohamed Mahmoud, Hank Vleeming, Joris W. Thybaut, Jeroen Poissonnier and Jo Dewulf (from UGent and PDC) can be assessed at https://doi.org/10.1016/j.jclepro.2022.134843.

ELSEVIER

Journal of Cleaner Production

Volume 379, Part 2, 15 December 2022, 134843

Developing circularity, renewability and efficiency indicators for sustainable resource management: Propanol production as a showcase

Jordy Motte [a], Pieter Nachtergaele [a], Mohamed Mahmoud [b], Hank Vleeming [b], Joris W. Thybaut [c], Jeroen Poissonnier [c], Jo Dewulf [a]

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https://doi.org/10.1016/j.jclepro.2022.134843

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The Manuscript 'Influence of Heat Treatment of MnNaW/SiO_2 Catalyst for Oxidative Conversion of Methane on Surface Structure and Magnetic properties' is published in Butlerov Communications. This manuscript is published by Etibar H. Ismailov, Dilgam B. Taghiyev, Sevinj N. Osmanova, Nazim M. Sadigov, Mahammedaly I. Abdullayev and Joris W. Thybaut.

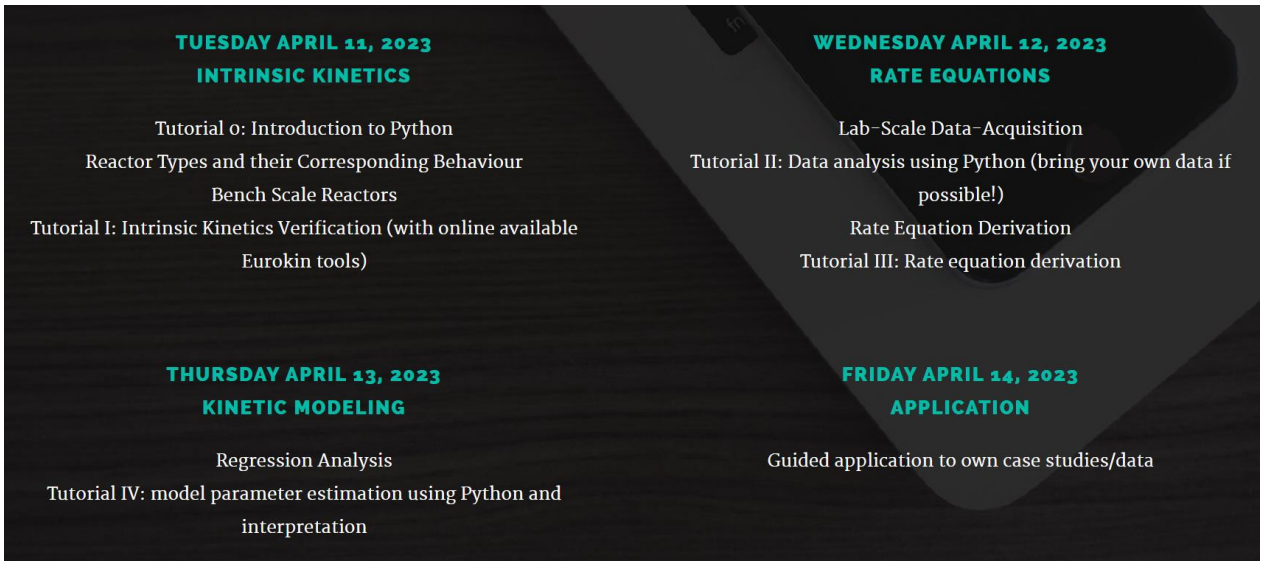
All publications are available via Open Access. Enjoy reading!

Summer School will become a Spring School

The Summer School will become a Spring School: 'from Idea to Multiscale analysis in Chemistry: modeling and simulation of chemical kinetics'.

Picture 2: the announcement of the Spring School

This Spring School will take place in Ischia (Italy) in April 2023. It will be four days of chemical reaction and reactor engineering courses varying from classical lectures alternated with interactive tutorials and group work. More information can be found on this website: https://imchem.ugent.be/.



Picture 3: the programme of the Spring School

Webinar in March 2023

A new webinar with the three Horizon 2020 sister projects **C123** – Methane oxidative conversion and hydroformylation to propylene, **ZEOCAT-3D** – Development of a bifunctional hierarchically structured zeolite-based nano-catalyst using 3D-technology for direct conversion of methane into hydrocarbons via methane dehydroaromatization and **BIZEOLCAT** – Bifunctional Zeolite based Catalysts and Innovative process for Sustainable Hydrocarbon Transformation will be organized in 2023.

We are glad to confirm that we have a date for a joint event with our sister projects. This webinar/conference will take place in Athens (Greece) on **16 March 2023**. It will be in hybrid format, so both presenters and participants can attend online. The event will be streamed live online and also be recorded for future use.

C123 39M and 45M progress meetings on 3-4 March 2022 and 13-14 September 2022

The seventh consortium meeting of the H2020-funded C123 project took place on 2 and 3 March 2022 and had a total of 5 online sessions (via Gather.Town). The entire consortium had scientific discussions on the technical work packages. The work package meetings showed promising status updates the partners made throughout every WP. The last session was a meeting of the consortium's General Assembly.

The eighth project meeting took place on 13 and 14 September 2022 at Linde HQ, Pullach, Germany. From the 11 consortium partners 24 participants joined the meeting, which had a total of 4 sessions. The entire consortium had scientific discussions on the technical work packages. The work package meetings showed promising status updates the partners made throughout every WP. A meeting of the consortium's General Assembly concluded the proceedings.

Picture 4: C123 participants during the 45M progress meeting at Linde HQ

Picture 5: C123 participants during the 45M progress meeting at Linde HQ

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814557.