SunCO$_2$Chem

WEBINAR

April 28th – 15.00 – 17.00 CET

Photocatalytic synthesis for a carbon-neutral production of fuels and chemicals

We invite you to take part in a webinar conference about photo(electro)catalysis for a sustainable energy conversion and storage into chemical bonds.

The webinar will comprise a session for better understanding of photo-electrochemical transformations driven by stable and efficient catalytic structures and how to combine photoelectrochemical measuremes for their application in artificial photosynthesis. After a keynote session, SunCoChem, FlowPhotoChem and DECADE Horizon 2020 projects' concept and methodology will be presented.

We would very much like you to be part of the this session and overall discussion.

Targeted to:

- Undergraduate, graduate or PhD students willing to learn about photo(electro)catalytic synthesis
- Researchers in chemical technologies from Universities and research centers
- Professionals in the chemical industry (technicians, R&D managers), etc.

REGISTER HERE!

The efficient storage and utilisation of solar energy in the form of chemicals or chemical energy will play a key role to transform the European industry into a low-carbon economy. In the long term, there will be a need for highly integrated solutions enabling the carbon-neutral production of high-value chemicals or energy, which is crucial to reduce CO_2 emissions. The development of integrated processes will require a systems-catalysis approach that includes engineering aspects as small-scale and intermittent operation.

SunCoChem, FlowPhotoChem and DECADE projects will develop cost-efficient solutions based on multifunctional photo catalytic systems which will enable upscaling and direct conversion of CO_2 and H_2O to fuels and chemicals with increased efficiency, stability and cost reduction.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 862192.

AGENDA

SunCO$_2$Chem

15.00 - Welcome and Introduction

Maria Navarro, *SunCoChem project coordinator*, **Eurecat**
Ricard Garcia, *Director of Chemical Technologies*, **Eurecat**

15.10 - Understanding the mechanism of (photo)electrochemical transformations in functional architectures for artificial photosynthesis

Francesca Toma, *CSD staff scientist, Joint Center for Artificial Photosynthesis (JCAP)*, **Lawrence Berkeley National Laboratory**

Stable and efficient catalytic architectures are a prerequisite for artificial photosynthesis. In order to achieve sustainable energy conversion and storage into chemical bonds, it is instrumental to understand the chemical transformation of these catalytic architectures under operating conditions. Understand how the performance of a (photo)electrode is impacted by chemical transformations during operation. This session will look at how functional, chemical, and structural heterogeneity over different length scales influences macroscopic performance and stability and show how we combine photoelectrochemical measurements with atomic force microscopy based techniques, and scanning transmission X-ray microscopy to gain a complete understanding of different material systems.

15.40 Questions & Answers keynote session

15.50 – SunCoChem: photoelectrocatalysis for CO_2 conversion for in-situ carbonylation through renewable energies

Miriam Diaz de los Bernardos, *SunCoChem Scientific Coordinator, Head of the Synhtesis and Catalysis Line at Chemical Technologies Unit,* **Eurecat**
Simelys Hernandez, SunCoChem technical coordinator, Associate Professor**, Politecnico di Torino**

16.05 – Flowphotochem: heterogenous photo(electro)catalysis in flow using concentrated light

Pau Farràs, *Director of the ChemLight group, Lecturer in Inorganic Chemistry at the School of Chemistry*, **National University of Ireland - Galway (NUIG)**

16.20 – DECADE: photoelectrocatalysis for the conversion of CO_2 avoiding water oxidation

Gabriele Centi, *Full Professor in Industrial Chemistry*, **University of Messina,**
President, **European Research Institute of Catalysis (ERIC)**

16.35 - Q&A and discussion

16.55 – Closure, end of the session

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SPEAKERS

By order of appearance

Ricard Garcia

***Director of Chemical Technologies Unit,* Eurecat**

He has a PhD in Chemistry from the Autonomous University of Barcelona (1995) and was a Chemical Engineering researcher at the Massachusetts Institute of Technology (1996-1998). A lecturer at Rovira i Virgili University (URV) since 1998 and a researcher for two decades in membrane technology and encapsulation, he has led many public and industrial projects in his field of research and in chemical technology more generally, both at the URV and also at the Chemistry Technology Centre of Catalonia (CTQC) until the merger with Eurecat.

María Navarro

***SunCoChem project coordinator,* Eurecat**

She holds a PhD in Chemical Engineering by the University of Barcelona on the degradation of antibiotics by photocatalysis and ozonation. During her stages in research organizations, María gained experience in the preparation of proposals and the coordination of technical projects. María has also long-time record in the private sector, where she has worked as project coordinator, supporting the strategical position of the companies. She has more than 10 years' experience in project management and has participated in several national and European projects. Currently she is European Program Coordinator at Eurecat, the main research and technology centre in Catalonia and the second largest private non-profit research organization in southern Europe. She supports Eurecat's research and innovation roadmaps in different fields of knowledge such as Digital, Sustainability or Industrial areas.

Francesca Toma

CSD staff scientist, Joint Center for Artificial Photosynthesis (JCAP)

Francesca got her Master of Science in Pharmaceutical Chemistry at the University of Padua, and her PhD in Biophysics at the International School of Advanced Studies in Trieste (Italy) in 2009. She joined UC Santa Barbara as a Marie Curie Researcher in 2011, and was a Postdoctoral Scholar for a brief time in the Chemistry Department at UC Berkeley, before joining the Berkeley Lab in 2013. Francesca focuses on the synthesis, characterization, integration, and understanding of catalysts, and light absorbers for an energy-efficient future. Francesca has more than 80 papers and has received numerous recognitions including the 2021 WCC Rising Star Award for ACS.

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Miriam Diaz de los Bernardos

SunCoChem scientific coordinator, Head of the Synhtesis and Catalysis Line at Chemical Technologies Unit, **Eurecat**

Miriam holds a degree in Chemistry (2008), a master's degree in synthesis and catalysis (2009) and a PhD in organic synthesis (2012) from Universitat Rovira I Virgili of Tarragona. During 2012 she gained experience in R&D projects at the Max-Planck-Institut für Kohlenforschung (Mülheim, Germany) as pre-doctoral scientist working in asymmetric synthesis. He joined to CTQC (Tarragona) in 2013 as junior scientist in organic synthesis and nanomaterial science working in the design, planning and execution of competitive and private multidisciplinary R&D projects. Currently she is the head of the synthesis and catalysis line at the Eurecat-Chemical Technological Unit and the scientific coordinator of the EU-funded project SunCoChem. Her expertise covers organic synthesis and the design of new catalysts which could result ultra-selective to obtain industrially relevant products from waste feedstocks such as CO2 in thermo-, photo- and electrochemical processes.

Simelys Hernandez

SunCoChem technical coordinator, Associate Professor, **Politecnico di Torino**

Simelys Hernández got the degree in Chemical Engineering, with highest honors (Lode) at both Politecnico di Torino (Polito, Turin, Italy) and at Universidad Central de Venezuela (Caracas, Venezuela) in 2004 and completed her PhD in Chemical Engineering at Polito in November 2009. She has been Assistant Professor (RTD-B) of the courses of Catalysis for the Energy and the Environment, Industrial Chemistry, Green Chemistry Products and Processes, and Photo-Electro-Catalytic Technologies for a Sustainable Chemical Industry at the DISAT department (Polito) and, from February 2021, she will Associated Professor leading a course on Petroleum Technology. She is responsible of the research team: CO2 reduction for a low-carbon economy (CREST group). She is collaborator at the CSFT of the Italian Institute of Technology (IIT@Polito), member of the RSC, MRS, ISE and SCI (Electrochemical Division). She is technical coordinator of the EU H2020 project SunCoChem (https://suncochem.eu/), principal investigator of the H2020 project OCEAN (https://www.spire2030.eu/ocean), vice-coordinator of the EU H2020 project RECODE (https://www.recodeh2020.eu/) and has worked in the coordination and scientific teams of other EU Projects (CELBICON, SOLHYDROMICS, MCWAP, ArtipHyction, ECO2CO2 and TERRA) related to the development of Novel Sustainable Photo-Electro-Chemical Processes for the capture and conversion of the CO2 from lab-scale (TRL2/3) to Pilot scale (TRL5/6).

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Pau Farràs

***Director of the ChemLight group, Lecturer in Inorganic Chemistry at the School of Chemistry,* National University of Ireland - Galway (NUIG)**

Dr Pau Farràs received his BSc in Chemical Engineering from the Autonomous University of Barcelona (Spain) in 2003 and obtained the PhD in Chemistry from the Materials Science Institute of Barcelona in 2009.

Dr Farràs is currently the coordinator of three EU-funded projects SEAFUEL, SOLAR2CHEM and FLOWPHOTOCHEM, and work package leader in HUGE and NEFERTITI. He is an active member of Hydrogen Europe Research and supporter of the SUNERGY initiative. He is author of 39 papers with around 1000 citations (h-index 18) and a book chapter on visible light-driven oxidation of organic substrates.

Gabriele Centi

***Full Professor in Industrial Chemistry*, University of Messina – Italy**
***President,* European Research Institute of Catalysis (ERIC)**

He was coordinator of the EU Network of Excellence IDECAT, and is actually President of IACS (International Association of Catalysis Societies), in the past also President of the EFCATS (European Federation of Catalysis Societies). He has been coordinator or PI in over twenty EU projects (between which the Network of Excellence on catalysis IDECAT), besides many other national and industrial projects.

He recently started and coordinated an ERC Synergy grant on plasma-catalysis. He is also part of the board of SUNERGY, the European initiative on solar fuels. He received several awards, among which the Chinese Academy of Science President's International Fellowship Initiative, PIFI, as Distinguished Scientist, and the Humboldt Research Award, and is involved in various editorial activities. He chaired the editorial board of ChemSusChem up to 2019 and is co-editor in chief of Journal of Energy Chemistry (both raised to high IF journals) and of the book series Studies in Surface Science and Catalysis, one of the oldest and more known in catalysis. He was chairperson of many international conferences, between which Europacat 2017 in Florence and the 16th International Zeolite Conference joint with the 7th International Mesostructured Materials Symposium (Sorrento, Italy, 2010).

He is author of nearly 500 scientific publications, 12 books and editor of over 20 special issues of journals. Current h-index is 86 with about 29.000 citations and over 350 papers with more than 10 citations (Google Scholar, March 2021).

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SunCoChem

Photoelectrocatalytic device for SUN-driven CO2 conversion into green CHEMicals

Grant agreement ID:
862192

Execution:
May 2020 – April 2024

Website:
www.suncochem.eu

The SunCoChem project aims to provide the chemical industry with an alternative to produce oxo-chemicals without using raw materials derived from carbon or oil. The project will develop a photoelectrocatalytic tandem reactor to manufacture valuable chemical oxo-products from renewable energies based on CO2, H2O and solar energy.

This will be achieved by process intensification, coupling a solar-driven CO2 reduction to CO/H2O oxidation to O2 with C-C bond carbonylation reaction catalysed by novel multifunctional hybrid photoelectrocatalysts. Based on a single-unit CO2 capture and conversion architecture to design a self-sufficient device, SunCoChem's innovation intends to reduce costs and CO2 emissions, decreasing the dependence of the European Chemical Industry on carbon-based raw materials.

FLOWPHOTOCHEM

Heterogenous Photo(electro)catalysis in Flow using Concentrated Light: modular integrated designs for the production of useful chemicals

Grant agreement ID:
862453

Execution:
June 2020 – May 2024

Website:
www.flowphotochem.eu

FLOWPHOTOCHEM aims to develop and model an integrated modular system based on continuous-flow heterogeneous photo(electro)catalytic reactors to produce relevant chemicals such as ethylene in the chemical sector, precursor to "green plastics" and many other high-value chemicals using abundant resources such as water, carbon dioxide and light. The project aims at delivering cost-efficient small-scale systems for intermittent operation to respond to the needs of rural, isolated territories, and distributed manufacturing. Novel multifunctional photo(electro)catalytic materials integrated into practical and scalable reactors are required in Europe to maintain the technological leadership in chemical manufacturing, while ensuring the deployment of sustainable processes which meet circular economy and green industry for a low-carbon future.

FlowPhotoChem will use the expertise of the partners to design, model, construct and validate an integrated modular system with improved energy efficiency and negative CO_2 emissions, since concentrated CO_2 will be valorised to high-value chemicals. The integrated system will be studied from a life cycle analysis perspective to quantify such effects, and to include a techno-economic study to quantify the cost of the technology and compare with comparable renewable solutions for the production of the same/similar chemicals.

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DECADE

DistributEd Chemicals And fuels production from CO2 in photoelectrocatalytic DEvices

Grant agreement ID:
862030

Execution:
May 2020 – April 2024

Website:
www.decadeproject.eu

DECADE project proposes a new photoelectrocatalytic (PEC) approach for the conversion of CO2 avoiding water oxidation as anodic reaction to overcome the current limits in PEC system and to maximize effective energy utilization. Novel PEC technology will be developed up to TRL 5 (prototype testing under environmental relevant conditions) using alcohols and waste CO2 as feed. Different applications are investigated: green refinery, distributed green solvent production and use to lower carbon footprint in methanol plant. In the main application, bioethanol and waste CO2 are used to produce a mixture of ethyl acetate (EA) and ethyl formate (EF) in ethanol, to be used as drop-in green solvent or as octane booster fuel component. On the anode side, ethanol is electro-oxidized to EA, while CO2 is electrocatalytic reduced to formate and acetate, which react catalytically with ethanol giving EF and EA, on the cathode side. An advanced PV cell/module, integrated in the device, but not in contact with the electrolyte (ethanol will act both as electrolyte and reactant), drives the reaction. Other application investigated is to use waste CO2 in the methanol production, using methanol as alcohol in this case. The net impact is to produce valuable added-value products through an energy-efficient PEC device, to lower the carbon footprint by using waste CO2 and introducing renewable energy in the production chain.

Optimization and engineering of electrode/materials and of the PEC design is driven by techno economic, LCA, market & social assessments. There are several elements of innovation in the proposed DECADE approach, based on the identification of the critical issues in the current PEC design. Consortium partnership has a strong industrial character but comprises top level scientists in the area and international collaboration with Japan to allow the best possible benchmarking for the novel approach developed.

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Organisers institutions

SunCO2Chem

DECADE

FLOW PHOTO CHEM

eurecat

JCAP JOINT CENTER FOR ARTIFICIAL PHOTOSYNTHESIS

NUI Galway OÉ Gaillimh

Università degli Studi di Messina

POLITECNICO DI TORINO

MORE INFORMATION

https://suncochem.eu/webinar-photocatalytic-synthesis/

Register open!

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@SunCoChem_EU

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