https://www.methasol.eu

METHASOL

CO_2 TO CH_3OH

INTERNATIONAL COOPERATION FOR SELECTIVE CONVERSION OF CO_2 INTO METHANOL UNDER SOLAR LIGHT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101022649 (METHASOL).

Deliverable Report

Start date of project:	01/07/2021
Duration of project:	42 months
Deliverable nº & name:	D8.2 PROJECT WEBSITE AVAILABLE IN ENGLISH
Version	3
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Participant responsible:	EUROQUALITY
Main authors:	ROMAIN HAMET, CAMILLE MICHEL, ETIENNE GAY
Website:	https://www.methasol.eu/

Nature of the Deliverable		
R	Document, report (excluding the periodic and final reports)	
DEM	Demonstrator, pilot, prototype, plan designs	
DEC	Websites, patents filing, press & media actions, videos, etc.	X
OTHER	Software, technical diagram, etc.	

Dissemination Level		
PU	Public, fully open, e.g. web	X
CO	Confidential, only for members of the consortium (including the Commission Services)	

Quality procedure			
Date	Version	Reviewers	Comments
03/11/2021	1	Sergio Navalon, Hermenegildo Garcia	Suggestions on the layout
01/11/2021 - 15/12/2021	2	All partners	Inputs on the partners' descriptions
02/12/2021	3	Sergio Navalon, Hermenegildo Garcia	Revision and validation of the website structure, as presented in this document

PROJECT SUMMARY

This report is part of the deliverables from the project "METHASOL" which has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 101022649.

Methanol is an appealing energy vectors, with attractive volumetric and gravimetric energy values, storable in liquid phase at ambient conditions of pressure and temperature, and that can be used as fuel directly or converted into chemicals or gasoline. However, its production lacks a sustainable route. Thus, the METHASOL project aims to produce methanol through a sustainable and cost-effective process based on the selective visible light driven gas phase CO_2 reduction, with a solar to methanol energy conversion efficiency of 5%. During 42 months, METHASOL will gather 14 partners from EU/Associated MS, China and the USA, including some of the world's most recognized researchers on artificial photosynthesis, to achieve a ground-breaking combination of a CO_2 reduction reaction (CO_2RR) system based on Metal-Organic Framework (MOF) and a graphitic Carbon Nitride (g-CN) for photocatalytic oxygen evolution reaction (OER), through a Z-scheme heterojunction. Following the definition of the system specifications (WP1), a first set of materials for OER and CO_2RR will be synthesised and their photocatalytic activity and stability will be screened (WP2). The most promising materials will be further analysed thanks to experimental characterisation and modelling (WP3), leading to guidelines used for designing an enhanced CO_2RR and OER materials (WP4). The best systems will then be integrated through a Z-scheme heterojunction, either with or without a mediator, and tested in tailored reactors operating in the gas phase under different conditions (WP5). A complete sustainability analysis will be conducted (WP6) to ensure the clean production of methanol. The cooperation between European and Chinese research entities will be consolidated to last beyond the project lifetime through the creation of a common exploitation plan (WP7). Through its ambitious activities on photocatalyst developments for solar to methanol conversion, METHASOL will propose a new path for decarbonizing Europe.

More information on the project can be found at https://www.methasol.eu.

OBJECTIVE AND EXECUTIVE SUMMARY

This report, i.e. D8.2 Project website available in English, presents the METHASOL website developed by EQY for the communication, the dissemination and the exploitation of the project developments and results. This report details, for each section of the website, the design to be used and the content that will be integrated. The main content of the website will be accessible in English and partner's languages, while some sections will be kept in English only.

The website has been structured in a way that is informative, easy to navigate through and can target all different types of stakeholders.

The deliverable presents the website structure and content dated end 2021. The website will evolve during the whole project and be completed continuously.

LIST OF PARTNERS

N°	Name	Short name	Country
1	UNIVERSITAT POLITECNICA DE VALENCIA	UPV	Spain
2	MAX-PLANCK-GESELLSCHAFT ZUR FORDERUNG DER WISSENSCHAFTEN EV	MPIKG	Germany
3	Wuhan University of Technology	WHUT	China
4	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	CNRS	France
5	IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE	ICL	United Kingdom
6	DALIAN INSTITUTE OF CHEMICAL PHYSICS, CHINESE ACADEMY OF SCIENCES	DICP	China
7	ECOLE NORMALE SUPERIEURE	ENS	France
8	ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE	EPFL	Switzerland
9	FUZHOU UNIVERSITY	FZU	China
10	TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY	TECH	Israel
11	NANKAI UNIVERSITY	NKU	China
12	UNIVERSITEIT MAASTRICHT	UM	Netherlands
13	METHANOL INSTITUTE	MI	United States
14	EUROQUALITY SARL	EQY	France

TABLE OF CONTENTS

HEADER

The header contains the following boxes. It will be accessible on all the website pages to ease the navigation, notably with the following dropdowns.

1	2	3	4	5	6
Home	**METHASOL Overview**	**METHASOL Progress**	**News & Events**	**Contact**	**English** *[translations included at a later stage]*

DROPDOWNS

2
METHASOL Overview
> Context
> The project
> Team
> Funding

3
METHASOL Progress
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4
News & Events
> News
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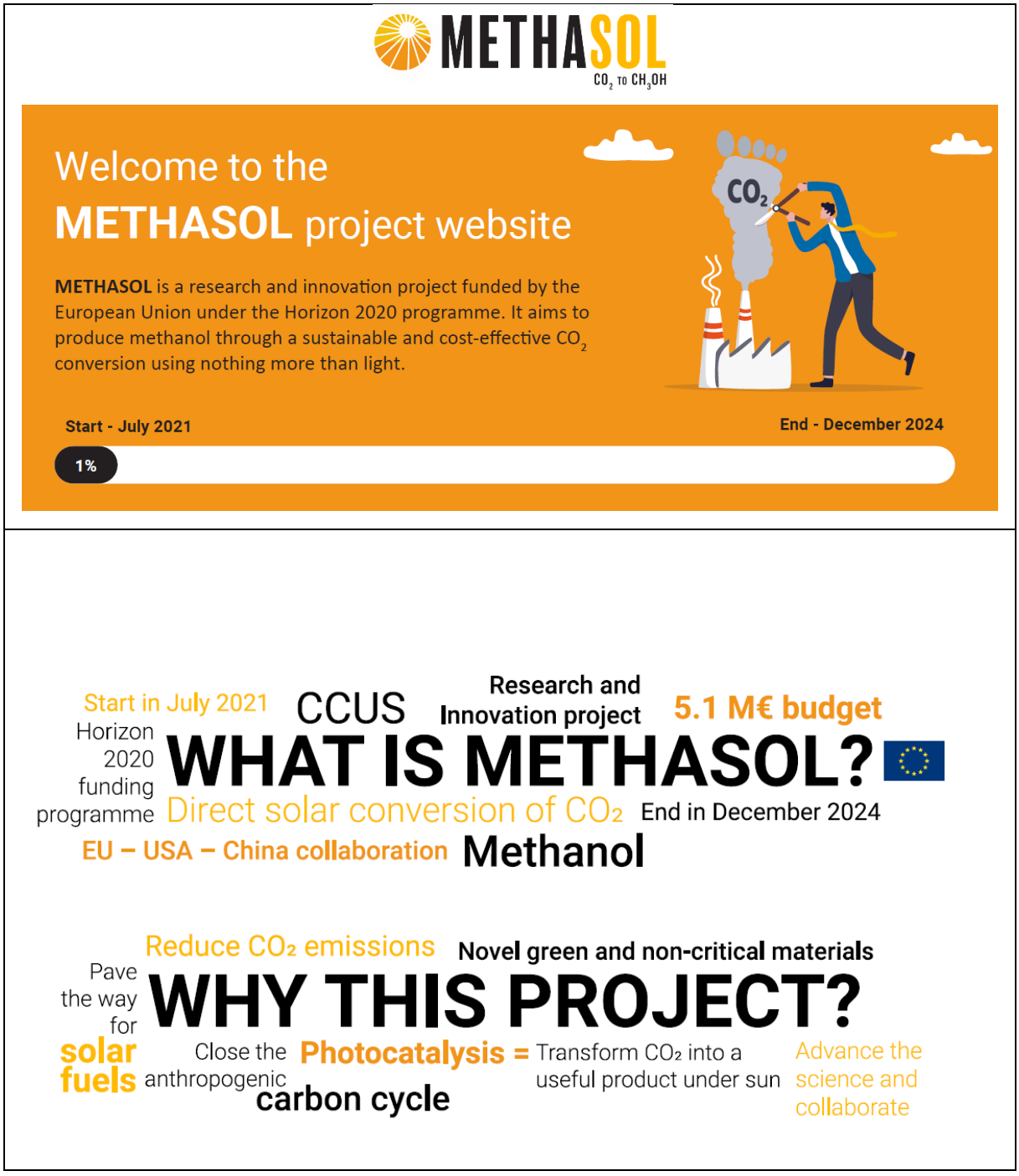
> Related projects

6
English
> 官話 (Mandarin)
> עברית(Hebrew)
> Deutsch (German)
> Español (Spanish)
> Français (French)
> Nederlands (Dutch)

HOMEPAGE

The Home page is the first page the user will see when going to the project website (https://www.methasol.eu/). It contains different subsections as listed below and detailed hereafter:



SO WHY METHANOL?

Methanol is an appealing energy vector, with attractive volumetric and gravimetric energy values, storable in liquid phase at ambient conditions of pressure and temperature, and that can be used as fuel directly or converted into chemicals or gasoline. However, its production lacks a sustainable route. Thus, the METHASOL project aims to produce methanol through a sustainable and cost-effective process based on the selective visible light driven gas phase CO_2 reduction, with a solar to methanol energy conversion efficiency of 5%.

CONTACT US

Name

Email Address

Message

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101022649 (METHASOL). This output reflects only the author's view and the European Union cannot be held responsible for any use that may be made of the information contained therein.

SUBSCRIBE TO OUR NEWSLETTER

Don't miss any update from our project: publication of results, participation in events, organisation of webinars. Newsletters will be sent approximately every 3 months.

[Form to be filled in with first name, last name, email address, language + "Subscribe" button]

METHASOL OVERVIEW

1. CONTEXT

CARBON CAPTURE, UTILISATION AND STORAGE (CCUS)

Power supply and carbon-intensive industries (cement, steel, limestone, petrochemical and chemical plants and waste incinerator) account for a large share of CO_2 emissions. Carbon capture utilisation and storage (CCUS) is one of the only technology solutions that can significantly reduce emissions from these key industrial processes (all of which will remain vital building blocks of modern society) as well as in coal and gas power generation and deliver the deep emissions reductions needed across. Several technologies at different levels of maturity and performances exist for the capture of carbon dioxide, e.g. oxy-fuel combustion, chilled ammonia technology, adsorptive processes, calcium looping, etc.

From this capture step, the conversion of CO_2 to useful chemicals and fuels is a promising strategy to close the anthropogenic carbon cycle and thereby to reduce CO_2 emissions. Various processes exist, depending on the targeted chemical or fuel, they all are quite demanding either in terms of materials used, in case the catalysts are removed and changed regularly, or of energy consumed, for operating the electro-catalysis of the chemical process. Therefore, there is a huge interest in looking into decarbonised and sustainable ways to make CO_2 a utilisable material for useful fuels, and artificial photosynthesis is one of them. Obtaining a chemical with high industrial uses but currently mostly produced from fossil fuels transformation, such as methanol, is a way to cut both the carbon emissions of the abovementioned carbon-intensive industries as well as the emissions due to the usual production of the chemical.

METHASOL has the ambition to make CCUS a reality for a more sustainable future.

To learn more on the topic:

https://ec.europa.eu/clima/policies/innovation-fund/ccs_en

https://ec.europa.eu/energy/node/98

https://www.globalccsinstitute.com/why-ccs/what-is-ccs/capture/

https://www.iea.org/topics/carbon-capture-and-storage/

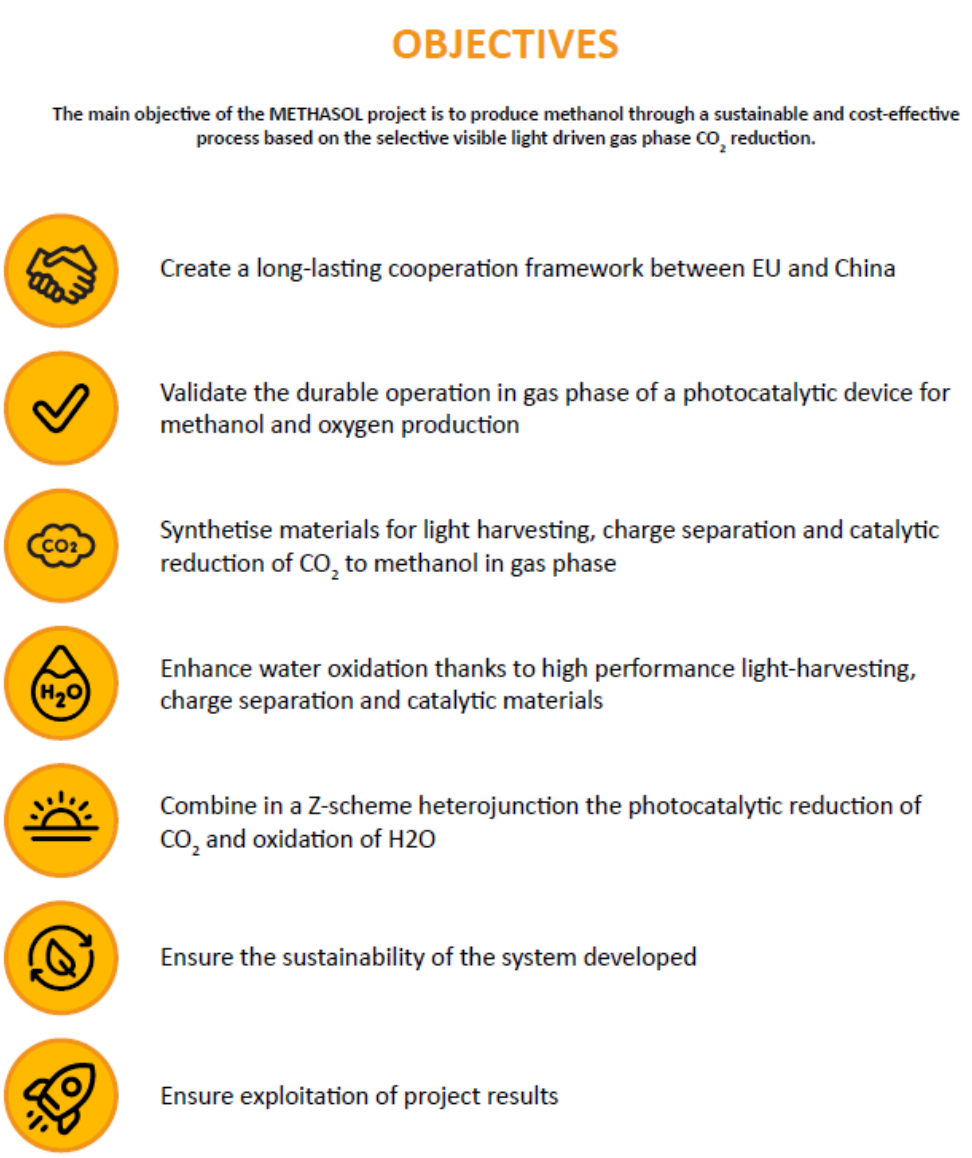
https://www.methanol.org/renewable/

2. THE PROJECT

THE METHASOL PROJECT

METHASOL is a European project with 14 partners that received 4.0 M€ from the EU's Horizon 2020 research and innovation programme out of a total budget of 5.2 M€.

OBJECTIVES



Create a long-lasting cooperation framework between EU and China

As China and Europe gather key expertise to make solar fuels a reality, the METHASOL project is based on five existing strong EU-China cooperation: ICL and DICP (e.g. on transient optical spectroscopies to measure charge carrier kinetics), MPIKG and FZU (e.g. Joint International Laboratory which was followed

by a DFG- NSC Program for four years), MPIKG and WHUT, UPV and FZU (incl. five joint papers and exchange of materials), EPFL and NKU. Together, all partners will strengthen inter-continent collaboration during the project and ensure the durability of the collaboration between EU and China on the topic of photocatalytic production of renewable fuels.

Validate the durable operation in gas phase of a photocatalytic device for methanol and oxygen production

METHASOL partners will design photocatalytic reactors that enable the optimal photocatalytic CO_2 reduction reaction (CO_2RR) to methanol at standard conditions of pressure and temperature. Two designs will be investigated: a single chamber reactor in gas phase, and a two-compartment reactor with gas phase for CO_2RR to methanol and liquid phase for the Oxygen Evolution Reaction (OER).

Synthetise materials for light harvesting, charge separation and catalytic reduction of CO_2 to methanol in gas phase

METHASOL partners will exploit Metal Organic Frameworks (MOFs) as photocatalysts, together with an appropriate Cu-based co-catalysts for tuning the selectivity of the CO_2RR reaction towards methanol (one of the main challenges of METHASOL). For optimal charge separation, the structure of MOFs will be optimised using inter alia computational predictions. To enhance CO_2RR light harvesting, partners will use carbon quantum dots (CQDs) that have shown their durable performances (creation of CQDs-MOFs@Cu complexes). For greater performance, the band gap will be tuned to the adequate values.

Enhance water oxidation thanks to high performance light-harvesting, charge separation and catalytic materials

METHASOL partners will develop an optimised gas phase OER system built out of the carbon nitride family (CN), playing the role of both light harvester and photocatalyst with a tunable band gap. Its optimisation will be realised thanks to advanced quantum calculations, operando transient optical analyses of charge transfer, charge carrier lifetimes and catalysis kinetics that will allow to build reliable structure-activity relationships. The optimal catalysts will be selected considering properties such as water binding and surface area. Finally, partners will consider addition of an OER co-catalyst for optimising further OER evolution rates.

Combine in a Z-scheme heterojunction the photocatalytic reduction of CO_2 and oxidation of H_2O

The METHASOL project will develop a complete photocatalytic system with optimised Z-scheme heterojunction by assembling CO_2RR and OER photocatalysts, optimised thanks to a unique computational tool developed during the project, combining advanced quantum and force-field based simulations. To mitigate risks and achieve the best performance possible, two strategies will be used (in line with the two designs mentioned above), 1/ an heterojunction without mediator and 2/ an heterojunction with mediator, a thin metal layer that will foster electron conductivity while avoiding degradation of yield due to poisonous reactions.

Guarantee the sustainability of the system developed

METHASOL partners will ensure the sustainability of their system by 1/ taking into account environmental aspects through life cycle assessment (LCA), 2/ assessing the social and societal impacts, in particular the European and Chinese independence gains in fuel production, jobs creation, social acceptance of the CO_2 streams coming from urban systems and of the new technology, and 3/ analysing the economic relevance of the solution compared to current production processes in both European and Chinese contexts.

Ensure exploitation of project results

The pathway for the project to reach industrialisation will be paved by an exploitation and a business plan. To foster the progress of the technology to higher TRLs, MI will support partners in the creation of an International Industrial Board (IIB) with global actors of the chemical and fuel industry with interests in solar methanol production. A common roadmap will be created to take the technologies to TRL9 less than 7 years after the end of the project.

CONCEPTS

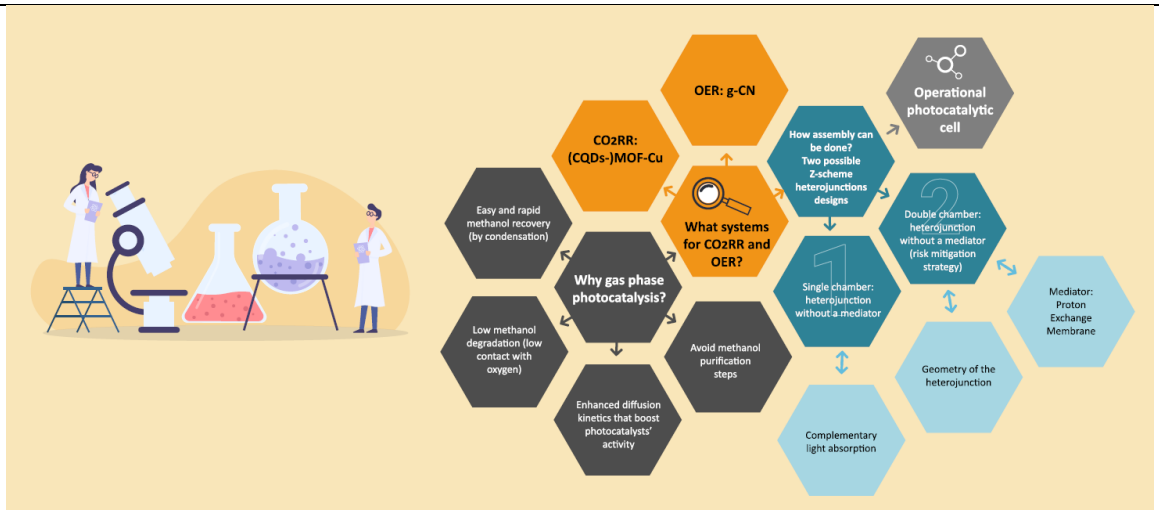
The general concept of the project is to combine through a Z-scheme photocatalytic cell a MOF-based CO_2RR system and a g-CN OER system. This concept is supported by three problematics, leading to an operational photocatalytic cell:

- Why gas phase photocatalysis?
- What systems for CO_2RR and OER systems?
- How can we do their assembly?

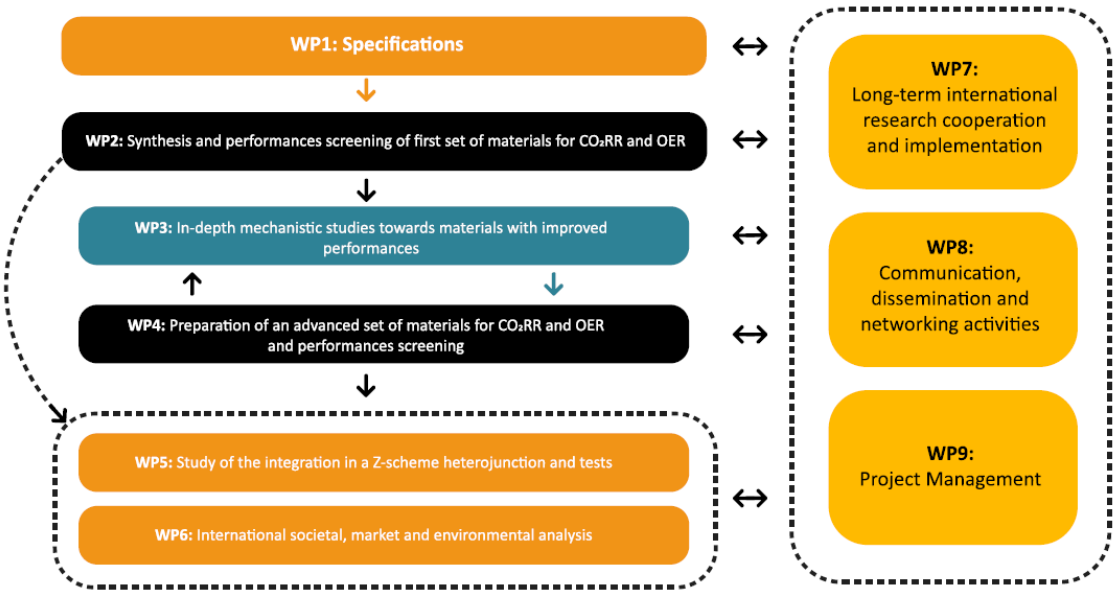
The following scheme gathers the main concepts investigated in the METHASOL activities. METHASOL investigates two main families of novel materials, with different purposes:

- Materials for CO2 reduction reaction (CO2RR), allowing to transform CO2 into methanol (CH3OH). These new materials will associate in a complex:
  - Carbon Quantum Dots (CQDs), a family of materials enhancing the light harvesting on this side of the reaction for a better efficiency
  - Metal-Organic Frameworks (MOFs), a family of materials which properties when associated with Cupper (Cu) will allow to selectively convert CO2 into methanol
- Materials for Oxygen Evolution Reaction to convert water (H2O) into oxygen (O2). This step allows in the end to obtain the H+ ions necessary to transform CO2 in methanol, it will be carried out by a family of materials called graphitic Carbon Nitrides (g-CN), recently highlighted for such properties

The core activities of the project will be to find the best non-toxic non-critical raw materials in each category that would allow the optimal operation of CO2 reduction reaction and Oxygen Evolution Reaction on each side **and** the good combination of both into a single photocatalyst, which would strongly increase the efficiency of the overall reaction. Finding the right green chemistry processes for all the steps of materials synthesis and combinations is also at the heart of the research done in METHASOL.



ACTIVITIES



WORK PACKAGES

WP1: Specification, led by UPV

Duration: July 2021 - November 2021

The aim of this WP is to prepare the technical developments and seamless component integration in the project. This will include the study of the required constraints to build a tandem CO_2RR/OER device, the realisation of a more advanced sketch of overall system, an update on the state of the art, and the description of technical specifications (operating conditions and test protocols).

WP2: Synthesis and performances screening of first set of materials for CO_2RR and OER, led by CNRS

Duration: October 2021 - February 2022

This WP aims to design, synthetise and characterise robust photoactive MOFs based composites and g-CN materials, evaluate separately their catalytic properties for CO_2RR and OER respectively, and finally assess their chemical and thermal stability under operating conditions. The outcome of this WP is the down-selection the best performing CO_2RR and OER photocatalysts to be further analysed in WP3 prior to their optimisation in WP4.

WP3: In-depth mechanistic studies towards materials with improved performances, led by ICL

Duration: March 2022 - June 2024

The aim of this WP is to analyse the physico-chemical characteristics (electronic, optical, spectroscopic) of the best performing WP2 materials, revealing the key catalyst descriptors which are the origin of their OER and CO_2RR performances, and optimising this level of performances by formulating concrete design guidelines towards advanced materials for WP4 (establishment of reliable structure-activity relationships). The advanced materials delivered by WP4 will be equally characterised in order to deepen the understanding, train and further refine the computational predictions.

WP4: Preparation of an advanced set of materials for CO_2RR and OER and performances screening, led by ENS

Duration: December 2022 - March 2024

This WP aims to synthetise a second set of advanced materials based on the findings and trends of WP2 and as supported and guided by WP3. Their photo-electronic and catalytic activities and stability under operation for CO_2RR and OER (primary characterisation) will be investigated in order to select candidates with the best performances. The best materials will be transferred to WP5 for integration in Z-scheme reactors and reviewed in WP3.

WP5: Study of the integration in a Z-scheme heterojunction and tests, led by WHUT

Duration: February 2022 - November 2024

The aim of this WP is to integrate in a small-scale prototype all components for CO_2RR and OER through a Z-scheme heterojunction, and then assess its performances through stress tests. Two cycles of advanced characterisation and tests are expected: one for materials transferred from WP2 and another with refined materials from WP4. Two types of heterostructured photocatalysts (with/without mediator) will be considered.

WP6: International societal, market and environmental analysis, led by UM

Duration: December 2022 - December 2024

This WP aims to develop and implement a common framework for international societal, market and environmental analysis. The societal, environmental and economic impacts of the solution on the total carbon cycle will be determined, and its relevance in the context of global warming will be assessed, as well as its market horizons on mid-long term.

WP7: Long-term international research cooperation and implementation, led by MPIKG

Duration: All along the project

The aim of this WP is to ensure the long-lasting collaboration between EU and China/USA on the topic of solar renewable fuels produced by photocatalytic way. To that purpose, partners will create and implement a research and industrial cluster on photocatalysis between EU and China in order to determine the roadmap to TRL9 for the solution.

WP8: Communication, dissemination and networking activities, led by EQY

Duration: All along the project

This WP aims at ensuring that the project results have the highest impact by highlighting its advances and structure.

WP9: Project management, led by UPV

Duration: All along the project

The aims of this WP are to ensure the seamless coordination and management of the project making optimal use of the project resources, to provide the best chance to the partners to jointly achieve the project's objectives.

EXPECTED IMPACTS

EXPECTED IMPACTS

From its early stages, the METHASOL project is expecting to positively impact the capacity of our societies to produce renewable (solar) fuels in a cost-effective and rely on all vectors of renewable energy beyond the sole electricity

Progress the scientific understanding and the technology state-of-the-art through the exchange of knowledge with China and/or USA

Strengthen the European and Chinese partners' technology base

Accelerate the outperforming development of renewable fuels compared to the best fossil fuel alternatives

Contribute towards building a sustainable renewable energy system

Foster the decarbonisation of the European economy

Entail economic activity and create job opportunities

Increase the European energy security by enabling fuel production from solar resource

3. TEAM

METHASOL gathers 9 organisations from 7 European countries (UPV, MPIKG, CNRS, ICL, ENS, EPFL, TECH, UM, EQY), 4 Chinese organisations (WHUT, DICP, FZU, NKU) and 1 US organisation (MI)

14 *organisations*
9 *countries*

[Localisation map of the partners]

PARTNERS

1. Universitat Politecnica de Valencia (UPV) – Coordinator of METHASOL

Country: Spain

Type: University

Logo:

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

INSTITUTO DE TECNOLOGÍA QUÍMICA

Website: https://hermenegildogarciagroup.es/

Relevant links to social media: https://twitter.com/navalon_sergio

https://www.linkedin.com/company/instituto-de-tecnologia-quimica-upv-csic/

https://www.linkedin.com/in/sergio-naval%C3%B3n-2692aa140/

The Universitat Politècnica de València (UPV)is a public, dynamic and innovative academic institution that maintains strong links with the social environment in which it carries out its activities. Our group is composed by national and international researchers specialized in the preparation of novel photocatalysts based on metal oxides, MOFs, COFs and graphenes among others.

The group leads and coordinates Methasol project. To this end, we should provide support to the rest of the partners involved in the work packages. Specially, UPV leads WP1 in which it performs tasks of preparing the technical developments and integration of components in the project; and WP 9 aimed to ensure the smooth coordination and management of the project optimizing project resources, to provide the best opportunity for the partners to jointly achieve the project objectives. In the other WPs (2, 4, 5,), the group works on the testing of the photocatalysts and the study of the optimal reaction conditions for their scaling up to industrial level for the efficient production of methanol in a photocatalytic way.

2. Max-Planck Gesellschaft zur Förderung der Wissenschaften EV (MPIKG)

Country: Germany

Type: Research organisation

Logo: 

Website: https://www.mpikg.mpg.de/en

Relevant links to social media: https://www.instagram.com/mpici_potsdam/

https://twitter.com/MpiciPotsdam

https://www.linkedin.com/company/max-planck-institute-of-colloids/

https://www.facebook.com/MPIKG.Potsdam/

The Max-Planck Institute (MPG) is an institution of the German state for the support of fundamental and basic research. There are 84 different Max Planck Institutes, all in different areas of Science, with more than 15000 employees. The MPIKG is devoted to the hierarchical construction of modern functional materials, biomimetics and sustainability, and has with in these operations a strong focus on photocatalyst design.

In Methasol, MPIKG focuses on advanced catalytic materials for the photochemical oxidation of water to dioxygen. This is done in plants by the photosystem II; which however has to be actively repaired every 30 minutes of operation. MPIKG developed a carbon and nitrogen based sustainable semiconductor to run this reaction stable and efficiently. In addition, they organize the international exchange of ideas and people between the European partners, but also between EU and China to create an international community of solar fuel science.

3. Wuhan University of Technology (WHUT)

Country: China

Type: University

Logo:

Website: **http://english.whut.edu.cn/**

Wuhan University of Technology (WHUT) is one of the leading Chinese universities under the direct administration of the Ministry of Education and one of the universities in the country's construction plan of world-class universities and first-class disciplines. In the past 70 years, WHUT has fostered over 500,000 engineers and technicians, maintaining itself the largest scale university under the direct administration of the Ministry of Education for nurturing talents oriented in the three industrial sectors: building materials industry, transportation industry and automobile industry and retaining itself an important base of nurturing high-level talents for the three industrial sectors as well as providing significant scientific and technological achievements.

In METHASOL, WHUT studies of the integration in a Z-scheme heterojunction and tests, by preparing powder and thin-film systems based on Z-scheme (S-Scheme) heterojunction, as well as their characterization, analysis and gas-phase photocatalytic activity.

4. Centre National de la Recherche Scientifique (CNRS)

Country: France

Type: Research organisation

Logo:

Website: https://www.lcs.ensicaen.fr/; https://www.ilv.uvsq.fr/; https://www.icgm.fr/

Relevant links to social media: https://twitter.com/ILV_UMR8180, https://twitter.com/gmaurin1

The Centre National de la Recherche Scientifique (CNRS) is a government-funded research organisation under the administrative authority of the French Ministry of Education and Research.
The CNRS partner of Methasol involves three different academic labs: 1) The Institut Charles Gerhardt of Montpellier (ICGM, UMR 5253 CNRS, Université Montpellier), one of the world leaders in the development of advanced molecular simulations to model the structure of MOFs and their properties. 2) The Institut Lavoisier of Versailles (ILV, UMR CNRS 8180-University of Versailles St Quentin en Yvelines & University Paris Saclay) with a strong expertise in the synthesis and characterization of porous hybrid materials such as MOFs and MOFs based composites. 3) The CNRS- Catalysis and Spectrochemistry Laboratory (LCS, ENSICAEN, University of Caen, worldwide recognised expert in the spectroscopic characterisation of MOFs.

In METHASOL, CNRS-ILV will be in charge of the synthesis and microstructural characterization of MOFs-Cu and MOF-Cu-CQDs based photocatalysts for CO2 reduction reaction and the development of MOFs-carbon nitride composites for Z-scheme heterojunction (WP2, WP4 and WP5). CNRS-ILV will lead WP2. CNRS-ICGM will model and rationalize the catalytic activity for both carbon nitride and MOF to guide the experimental effort towards improved systems (WP3) and anticipate the properties of the MOF/carbon nitride composites (WP5). CNRS-LCS will perform an *Operando* investigation of the best MOFs and composites under photocatalytic conditions using FT-IR and Raman (WP3 and 5).

5. Imperial College of Science Technology and Medicine (ICL)

Country: United Kingdom

Type: University

Logo: Imperial College London

Website:

https://www.imperial.ac.uk/durrant-group/

Relevant links to social media: https://twitter.com/imperialcollege

https://twitter.com/CPE_Imperial

https://twitter.com/durrant_group

Imperial College London is a science, engineering and medicine-based university with 13,000 students and 6,000 staff, and is home to the greatest concentration of high-impact research of any major UK university. Energy is one of the College's key strategic themes for growth. The College has made significant recent investments to create the Centre for Plastic Electronics , which is one of the largest global research efforts in the field of organic and molecular electronics.

In METHASOL, the Durrant group will focus on transient and operando optical spectroscopic analyses of photocatalysts prepared in this project, employing these techniques to development materials and photocatalyst design guidelines, as detailed in WP3 and WP5. ICL will lead WP3. The Durrant group has extensive experience in the use of transient and operando optical spectroscopic to interrogate the function of photocatalysts, including inorganic, molecular and polymeric (including carbon nitride). These studies have included both analyses of charge separation and recombination in such systems, and operando analysis of catalysis kinetics.

6. Dalian Institute of Chemical Physics, Chinese Academy of Sciences (DICP)

Country: China

Type: Research organisation

DALIAN INSTITUTE OF CHEMICAL PHYSICS, CHINESE ACADEMY OF SCIENCES

Logo:

Website: http://www.dicp.cas.cn/

Relevant links to social media:

LinkedIn: https://www.linkedin.com/school/dalian-institute-of-chemical-physics-chinese-academy-of-sciences-china/

Twitter: https://twitter.com/dicp_cas

The Dalian Institute of Chemical Physics, Chinese Academy of Sciences, is one of the most vibrant and inspirational scientific research institutes in China. DICP has established a long track record of major academic and industrial accomplishments in catalytic chemistry, chemical engineering, chemical lasers, molecular reaction dynamics, organic chemistry, modern analytical chemistry and biotechnology. DICP focuses on sustainable energy research and coordinates the development of environment optimization, biotechnology and advanced material in a multidisciplinary atmosphere by strengthening technological integration and innovation.

In METHASOL, DICP is involved in the mechanism characterization of photoanodes and photocathodes (WP3) with time-resolved and space-resolved spectroscopy.

7. Ecole Normale Superieure (ENS)

Country: France

Type: University

Logo: 

Website:
https://www.chimie.ens.fr/recherche/laboratoire-imap/imap/

Relevant links to social media: https://twitter.com/MOF_IMAP

The Ecole Normale Supérieure (ENS) is an internationally renowned institution. It is one of the most selective and challenging institutions of higher learning and research in France, attracting the best students. It forms elite researchers and public administrators. It has 14 departments from humanities to sciences, and it promotes inter-disciplinary education. ENS is consistently ranked among the top three universities in continental Europe. ENS respects the principles of the European Charter and Code for Researchers and has the HRS4R certification. ENS is a founding member of the Paris Sciences et Lettres (PSL) university. PSL has a world-leading reputation, as the first French university being ranked 36th worldwide in THE Ranking (PSL was ranked 4th Best Young University by THE 2019, 53th in QS 2020). PSL counts 17.000 students which includes 2.500 PhD students (41% being international PhD students). PSL aims to develop and promote the interdisciplinary and international excellence of its members.

In METHASOL, the ENS-IMAP will be in charge of the synthesis, the development and the structural characterization of newly reported and novel in-house MOFs materials (mainly the MIP series) and their photo-catalytically active Cu-based composites (including CQDots and/or PCN). ENS-IMAP will rely on in-house developed strategies of MOF and Cu grafting loading following the greenest and the most sustainable routes (including the use of water and room temperature synthesis). ENS will lead the WP4.

8. Ecole Polytechnique Federale de Lausanne (EPFL)

Country: Switzerland

Type: University

Logo:

Website: **https://www.epfl.ch/labs/lpi/**

Relevant links to social media: https://www.linkedin.com/school/epfl/, **https://twitter.com/epfl**

EPFL is one of the two Swiss Federal Institutes of Technology. With the status of a national school since 1969, the young engineering school has grown in many dimensions, to the extent of becoming one of the most famous European institutions of science and technology. EPFL focuses on three missions: education, research and innovation. EPFL collaborates with an important network of partners, including other universities and colleges, secondary schools and gymnasiums, industry and the economy, politicians and the general public, in order to have a real impact on society.

In METHASOL, the laboratory of Photonics and Interfaces will mainly carry out three tasks in the proposal: 1) Design and test Cu-based molecular catalysts and Cu-based alloys as catalysts for CO2 conversion; 2) Employ operando Raman spectroscopy to probe reaction intermediates and investigate the reaction mechanism for CO2 conversion; 3) Collaborate with Synchrotron facilities such as PSI to monitor the dynamic change

9. Fuzhou University (FZU)

Country: China

Type: University

Logo:

Website: **https://www.fzu.edu.cn/**

Fuzhou University (FZU) is founded in 1958, and has developed into a key university with a multidisciplinary and coordinated development of science, engineering, economics, management,

literature, law, arts and other disciplines in China. FZU is a double first-class initiative university, and '211' project university.

The university has 27 colleges and 38,855 ordinary undergraduate students. The university has 90 undergraduate majors, 38 first-level master's degree points, 21 master's degree authorization points, 14 first-level disciplines doctoral points, 2 professional degree doctoral points, 10 post-doctoral research mobile stations. The comprehensive strength of the school ranks 301-400 and 252nd in 2021 QS Asia, and 60th in mainland universities.

In METHASOL, the State Key Laboratory of Photocatalysis on Energy and Environment will carry out oxygen evolution reaction by polymeric carbon nitride polymers.

10. Technion – Israel Institute of Technology (TECH)

Country: Israel

Type: Research organisation

Logo:

Website: www.technion.ac.il

Relevant links to social media: https://www.facebook.com/TechnionLive

The Technion – Israel Institute of Technology is a public research university located in Haifa, Israel. Established in 1912, the Technion is the oldest university in the country. The university offers degrees in science, engineering and related fields such as architecture, medicine, industrial management, and education. It has 19 academic departments, 60 research centres, and 12 affiliated teaching hospitals. Since its founding, it has awarded more than 100,000 degrees and its graduates are cited for providing the skills and education behind the creation and protection of the State of Israel. Technion's 565 faculty members currently include three Nobel Laureates in chemistry. Four Nobel Laureates have been associated with the university. The Technion is considered to be a major factor behind the growth of Israel's high-tech industry and innovation.

In METHASOL, the Technion group will characterize both the MOFs and the GCN materials by means of transient IR spectroscopy, will model the behaviour of CO2 to methanol units and will test the performance of the units.

11. Nankai University (NKU)

Country: China

Type: University

Logo:

Website: **https://jingshanluo.com/**

Nankai University (NKU) is a key multidisciplinary and research-oriented university directly under the jurisdiction of the Ministry of Education of China, a Class A university of the "National Double First-Class" Initiative, located in Tianjin on the coast of the sea of Bohai. It was founded in 1919, by educators Yan Xiu and Zhang Boling. Nankai has long been recognized as one of the most prestigious universities in China, constantly ranked among various top 10 lists of Chinese Universities. As a comprehensive university with a wide range of disciplines, Nankai features a balance between the humanities and the sciences, a solid foundation and a combination of application and creativity. The university has 26 academic colleges, together with the Graduate School, the School for Continuing Education, the Advanced Vocational School, the Modern Distance Education School, and categories covering literature, history, philosophy, economics, management, law, science, engineering, agriculture, medicine, teaching and art.

In METHASOL, NKU will be involved in the design of photoreactors, photocatalysts and Cu co-catalysts. NKU will work with partners such as TECH, ITQ and WHUT to develop new type photoreactors that are tailored for this project. NKU will also work on CO_2 reduction co-catalysts, such as Cu_2O nanoparticle catalyst and other metallic co-catalysts. Jingshan Luo, Ying Zhao and their team in NKU have worldwide reputation in developing photocatalysts, electrocatalysts and photovoltaics for solar energy conversion and have tremendous experiences in reactor designs for solar water splitting and solar driven CO_2 reduction.

12. Universiteit Maastricht (UM)

Country: Netherlands

Type: University

Logo:

Website: https://www.maastrichtuniversity.nl/

Relevant links to social media: https://www.facebook.com/maastricht.university

https://www.instagram.com/maastrichtuniversity/

https://twitter.com/maastrichtu

https://www.linkedin.com/school/maastricht-university/

https://www.youtube.com/user/maastrichtuniversity

Maastricht University (UM) is the most international university in the Netherlands and, with more than 20,000 students and 4,400 employees, is still growing. UM is the coordinator of Young Universities for the Future of Europe (YUFE) and the 6th best university worldwide under 50 years (THE 2021). The Aachen-Maastricht Institute for Biobased Materials (AMIBM) is a collaboration of UM with RWTH Aachen University, Germany. AMIBM strives for ground-breaking conversion of biomass to biobased materials and into product applications and offers a unique approach covering the entire biobased materials value chain, including raw materials (feedstock), polymers (materials) and the end products derived from them (applications) and sustainability evaluations over the whole value chain.

In METHASOL, UM performs research in the area of sustainability assessment and Life Cycle Assessment of chemicals and materials, focusing on renewable resources, greener production routes and circular end of life scenarios.

13. Methanol Institute (MI)

Country: USA

Type: Industry

Logo:

Website: www.methanol.org

Relevant links to social media:

https://twitter.com/MethanolToday
https://www.facebook.com/MethanolToday/
https://www.linkedin.com/in/methanol-institute/

The Methanol Institute serves as the trade association for the global methanol industry, representing methanol producers, distributors and technology providers from offices in Washington, Brussels, Singapore, Beijing and Delhi.

In METHASOL, MI ensures that project partners meet relevant international standards for the commercial production an sale of methanol as well as the requirements for the use of methanol for road and marine transport and chemical derivatives. Contribute to discussions on LCA of RES-3 fuel as well as social energy security aspects of the project. Facilitate interregional cooperation with a broad network of stakeholders and identify necessary activities to establish a commercial roadmap for the market introduction of the product produced from the photosynthesis reactor. MI will assist in developing a dissemination strategy for the project and be responsible for organizing and managing the international industrial board, providing a bridge between project partners and the methanol sector.

14. Euroquality (EQY)

Country: France

Type: SME

Logo: euroquality A Warrant Hub Company

Website: https://euroquality.fr/en/

Relevant links to social media:

LinkedIn: https://www.linkedin.com/company/euroquality/

Twitter: https://twitter.com/Euroquality_EU

Established in 1997, Euroquality is a service provider specialised in innovation consulting. Its main activities are setting up European projects (e.g. H2020, LIFE, Erasmus+), carrying out economic studies, policy evaluation, technological and technical studies, development of communication material, training, and the management of national and European projects.

In METHASOL, Euroquality is responsible for the information management, animates the consortium and develops tools that facilitate know-how exchanges and collaborative work. Euroquality is also in charge of the communication activities (hence leading **WP8**) in close collaboration with the coordinator and all partners of the project. Finally, Euroquality takes care of the exploitation and develop the business plan for the sustainable solutions developed in the project to ensure their economic and technical feasibility.

INTERNATIONAL INDUSTRIAL BOARD

[section to be completed when members join the IIB]

4. HORIZON 2020

Horizon 2020 was the main research and innovation programme of the European Union between 2014 and 2020, with nearly 80 B€ of funding available over this 7-year period - in addition to the private investment that this funding framework attracted. It aims at more breakthroughs, discoveries and world-firsts by taking great ideas from the laboratory to the market.

HORIZON 2020 STATISTICS

To this day, Horizon 2020 has led to

The signature of more than	*The support of more than*	*A total contribution of more than*
35,000	***172,000***	***66 B€***
Grants	*Participants in their research and innovation activities*	

More information can be found on the Horizon 2020 Dashboard

AND AFTER HORIZON 2020?

Horizon Europe is the research and innovation framework programme running from 2021-2027. The European Commission has proposed to provide this new programme with an envelope of €100 billion.

Horizon Europe will incorporate research and innovation missions to increase the effectiveness of funding by pursuing clearly defined targets. Five mission areas have been identified, each with a dedicated mission board and assembly. The board and assembly help specify, design and implement the specific missions which have launched under Horizon Europe in 2021:

- Adaptation to climate change including societal transformation
- Cancer
- Climate-neutral and smart cities
- Healthy oceans, seas, coastal and inland waters

- Soil health and food

[Insert a PDF reader with this presentation of Horizon Europe]

Learn more about Horizon Europe here.

METHASOL PROGRESS

1. DELIVERABLES

METHASOL will make available several deliverables that will be published during the project activities by partners. This page lists the deliverables that will be published in each work package. To learn more about a deliverable, click on it!

Only public deliverables are accessible for download.

[Confidential deliverables are indicated in red down here, there can be a mention "Confidential" previous to the deliverable name. Public deliverables will be shaded if they are not released yet]

WP1: Specification

D1.1: Guidelines for sustainability of developments [description: A green chemistry-based guideline, which can be used for the choice of materials.]

D1.2: Constraints and specifications on heterojunction materials [description: This deliverable must indicate the wanted characteristics and photocatalytic properties of the materials to be prepare with quantitative key performance indicators.]

D1.3: First designs of PC reactors [description: A single chamber reactor without mediator and a two-chamber reactor with mediator will be designed and reported.]

D1.4: Specifications on CO_2RR [description: This report will describe the specifications on MOF-based materials suitable for CO_2RR (together with Cu-based catalysts), taking into account their foreseen catalytic performances, their stability and their synthesis.]

D1.5: Specifications on OER [description: This deliverable will clarify the OER related specifications, including the applied operation conditions and the required production rates. The catalyst should bind methanol much weaker than water, show a nice stability, be used in minimum amount, be affordable, contain no toxic elements, and be sustainable.]

D1.6: Test protocols [description: Test parameters (CO_2 concentration, contaminants, light source, flow rate of reactant gas, duration of the test) shall be defined. Other parameters (size of device, amount of catalyst loading) will also be specified. The analysis protocol for liquid products and oxygen (from anode) will also be established.]

WP2: Synthesis and performances screening of first set of materials for CO_2RR and OER

D2.1: Report on the synthesis and characterisation of a series of MOFs-Cu, MOFs@Cu_2O and MOFs@M/CQDs composites proposed for CO_2RR [description: This report aims to describe the synthesis protocols and the complete characterisation of a series of MOF-Cu and CQDs-MOF-Cu.]

D2.2: Report on the characteristics of the materials proposed for OER [description: This report will refine the following characteristics for OER: all carbon nitride samples to be optimised will have CN as the optical transducers/ antenna, a metal ion within the pores to support exciton splitting, and a surface decoration to control substrate binding and repellence. The finer details as specific surface area, relative amounts and thickness, as well as doping for optical coverage of the solar spectrum are to be determined by experiments.]

D2.3: Evaluation of the photocatalytic features of the different solids under study for the selective CO_2 reduction to CH_3OH using simulated irradiation and H_2O as reducing agent [description: This report details the photocatalytic performance of the materials studied, including product analysis and efforts to achieve methanol selectivity.]

D2.4: Screening of OER materials photocatalytic features under simulated irradiation [description: The various types of g-CN previously prepared will be examined, compared, selected and reported in their ability to perform OER, under simulated solar light, based on quantum efficiency, dependence on wavelength and intensity, long-term stability and repeatability assessments.]

WP3: In-depth mechanistic studies towards materials with improved performances

D3.1: Report on the experimental/modelling characterisation of the photoactive CO_2RR MOFs [description: This report will include the results of the spectroscopic characterisation and molecular modelling of the CO_2RR MOF materials studied, together with the proposed mechanism, and guidelines to improve of their efficiency.]

D3.2: Report on the experimental/modelling characterisation of the photoactive OER g-CNs [description: This deliverable aims to provide a summary of all the electronic, spectroscopic and optical features of the g-CNs.]

D3.3: Relations between the structural/chemical/electronic features of MOFs/g-CNs and their OER and CO_2RR catalytic activities [description: This deliverable will include a rational analysis of the electronic features of g-CNs/MOFs and their catalytic activities to establish a structure/chemical activity relationship.]

WP4: Preparation of an advanced set of materials for CO_2RR and OER and performances screening

D4.1: Report on at least 3 optimised MOFs/Cu species /CQDs composites for CO_2RR [description: This deliverable will report on the design of second-generation MOF-based materials for CO_2RR based on the best performing candidates identified in WP2 and the modelling studies performed in WP3, including the synthesis and characterisation of at least three optimised ones.]

D4.2: Report on at least 3 optimised g-CNs for OER [description: This report will detail the three best g-CN optimised systems for OER that will be delivered in gram quantities to the partners.]

D4.3: Evaluation of the CO_2RR photocatalytic features of the different solids under study for the selective CO_2 reduction to CH_3OH using simulated or natural sunlight irradiation [description: This

report will detail the results of the photocatalytic CO_2RR to methanol, including product analysis, description of the origin of methanol selectivity and isotopic labelling studies.]

D4.4: Screening of OER materials photocatalytic features under simulated or natural irradiation [description: The selection of OER materials will be done and reported, thanks to performance measurements first under simulated light, and then under natural conditions and long term operation.]

WP5: Study of the integration in a Z-scheme heterojunction and tests

D5.1: Delivery of reactors for tests [description: Two type of prototype reactors (single chamber reactor without mediator and two-chamber reactor with mediator) will be made and delivered according to the optimised cell.]

D5.2: Report on photocatalytic systems designed in heterojunction without a mediator [description: The report will describing the preparation, characterisation and photocatalytic activity of the Z-scheme heterojunction without a mediator.]

D5.3: Report on photocatalytic systems designed in heterojunction with a mediator [description: The report will describing the preparation, characterisation and photocatalytic activity of the Z-scheme heterojunction with a mediator.]

D5.4: Characterisation of the best photocatalytic systems for methanol production integrated in a Z-scheme heterojunction [description: This deliverable will provide an in-depth analysis of the interface formed between the best CO_2RR MOF/OER g-CN composite in terms of microstructures and charge transfer.]

D5.5: Report on the performances of the most promising photocatalyst in several operation conditions and scales [description: This report will describe the photoreactors, operation conditions and scale up of the best photocatalytic systems.]

WP6: International societal, market and environmental analysis

D6.1: Common framework and data for sustainability assessment [description: A list of common criteria for sustainability in terms of environment, market, society, which will be used for the choice of the industrial site locations.]

D6.2: List of potential demonstration sites in the EU and China [description: A list of five potential locations for demonstration sites in the EU and China, including data for the background utilities per each specific location.]

D6.3: Report on Life-Cycle Assessment [description: A list of main sources causing environmental damages as well as the way(s) for improvement(s).]

D6.4: Report on Life-Cycle Costing [description: A report on the calculation of the production cost of methanol under possible scenarios in specific industrial locations.]

D6.5: Report on Social acceptance and energy security study [description: A survey on the public acceptance of the new technology and a report on calculation of the total reduction in oil and gas import.]

WP7: Long-term international research cooperation and implementation

D7.1: Elucidation of interregional barriers [description: The EU-China cooperation potential barriers will be investigated through consortium discussions and reported.]

D7.2: Agenda for intercontinental researcher mobility [description: This report will be the result of an executive meeting to fix the details of students exchange, senior researcher visits for talks and seminars, and at least 2 joint conferences.]

D7.3: Planning of next steps of the interregional cooperation [description: This report will describe what has been approved by the consortium as continuation of the cooperation between themselves (new research partnerships, student and researchers exchange, etc.).]

D7.4: Innovation Management Plan [description: This deliverable is a report detailing the strategies for the management of the IP in the project.]

D7.5: Intellectual Property Rights Report [description: This deliverable is a summary of the IPR management done in the project.]

D7.6: Roadmap to TRL9 and exploitation plan [description: A detailed plan for upscaling the system will be reported, together with remaining challenges and precise exploitation of the project results.]

WP8: Communication, dissemination and networking activities

D8.1: Communication and dissemination plan [description: The Communication and Dissemination Plan will be a strategic document, defining the C&D goals and tools, the target audience, the main messages to be conveyed, etc.]

D8.2: Project website available in English [description: The website will contain specific sections about the project and its results that will all be available in English and Mandarin.]

D8.3: International Industrial Board composition and roles [description: This deliverable is a list of all members of the Industrial Cluster Board, constituted in order to foster the afterlife of the project, its replicability and its transferability.]

D8.4: Report on networking activities and Mission Innovation challenge [description: Summary of all the networking activities done during the project including the collaboration with Mission Innovation Challenge.]

WP9: Project Management

D9.1: Tools for management and information flow [description: Management templates will be prepared for collecting administrative partner information, establishing cost statements , evaluating progress achieved by each partner for each task, for deliverable and technical reports.]

D9.2: Data Management Plan and Ethics Requirement 2 [description: The DMP (Data Management Plan) will be written following the template provided by the European Commission.]

D9.3: Project performance report [description: The project performance report will be issued at the end of the project, identifying best practices and lessons to be kept in mind for the project afterlife.]

D9.4: Identification and recruitment procedures report (Ethics Requirement 1) [description: This report will detail with partners any procedure used to identify/recruit any entity or person, in line with the Ethics requirements 1.]

D9.5: Details on materials imported to/exported from the EU (Ethics Requirement 3) [description: This report will detail on the materials that will be imported to/exported from the EU in line with the Ethics Requirement 3.]

D9.6: Feedback on health and safety procedures applied (Ethics Requirement 4) [description: This report will contain the copies of import/export authorisations, as required by national/EU legislation, and the lab authorisations, in line with Ethics Requirement 4.]

2. PUBLICATIONS

METHASOL partners will publish some of their results in several high influence peer-reviewed journals. You will find links to all these publications on this page.

IN BRIEF

[Title] *[Authors (Partner name), Journal, Date]*
[boxes to be developed] *[Abstract, mention of a Work Package linked]*
Keywords: [XX]

3. COMMUNICATION MATERIAL

Feel free to communicate about METHASOL and help us to increase the visibility and impacts of our project!

You can use the following communication material:

METHASOL presentation

METHASOL Poster

METHASOL Leaflet

…

Want to tell your community about METHASOL? Or interested in the technology developed in METHASOL?

Share it on LinkedIn and Twitter!

Our networks

[Twitter + LinkedIn logos and links]

NEWS & EVENTS

1. NEWS

To have a regular update on the project, follow us on LinkedIn with our H2020 METHASOL project page and @H2020METHASOL and on Twitter with @methasol.

LinkedIn: https://www.linkedin.com/company/h2020-methasol/

Twitter: https://twitter.com/methasol

[Small LinkedIn feed]	*[News, with image, date, author, short description linking to the article page]*
[Small Twitter feed]	

2. EVENTS

To have a regular update on the project, follow us on LinkedIn with our H2020 METHASOL project page and @H2020METHASOL and on Twitter with @methasol.

LinkedIn: https://www.linkedin.com/company/h2020-methasol/

Twitter: https://twitter.com/methasol

[Image of all events (mosaic) as on https://www.mof4air.eu/events/]

[Short text for each event]

3. RELATED PROJECTS

Here are a few related projects to METHASOL

Do you want us to add your project? Please contact us!

Israel Science Foundation, (2014-2018)	Objective: Developing and optimising the transient IR measurements technique. Performing preliminary measurements with several types of MOFs. Link with METHASOL: This type of measurements will be used to characterise the new MOFs, g-CN and their composites. They will be used to understand the relation between type, structure and doping versus photocatalytic properties. *Learn more here: https://www.isf.org.il/#/*

H2020-ZESMO (2016-2018)	Objective: Zeolitic reactor hosting Subphthalocyanines and Metal Oxides as photocatalytic system for opto-electronic applications. Link: Synthesis of photocatalysts based on zeolites hosting metal complexes. *Learn more here: https://cordis.europa.eu/project/id/709023*
FP7-PEOPLE-2011-IEF CO2PHOTORED (2012-2014)	Objective: Carbon dioxide photoreduction: A great challenge for photocatalysis. Link: Finding of cocatalyst for the artificial photosynthesis to methane. *Learn more here: https://cordis.europa.eu/project/id/298740*
FP7-PECDEMO-IDT (2014-2017)	Objective: To develop a photoelectrochemical (PEC) water splitting device based on low-cost and abundant materials capable of converting over eight percent of solar energy into hydrogen. Link: The experiences accumulated in PEC water splitting reactor designs are helpful and transferable for photocatalytic CO_2 reduction. *Learn more here: https://cordis.europa.eu/project/id/621252*
National Natural Science Foundation of China, Grant No. 21203185 (2013-2015) 国家自然科学基金委员会 National Natural Science Foundation of China	Objective: The project (NSFC, 21203185) studied the charge dynamics of TiO_2 photocatalysts with different time-resolved spectroscopic techniques, and revealed the roles of crystal morphology and phase junction in photocatalysis. Link: The time-resolved spectroscopic techniques will be used in this project. *Learn more here: http://www.nsfc.gov.cn/english/site_1/index.html*
SCeLiO-4B; EFRO (2015-2019) Biorizon The way to aromatics	Objective: Process intensification via integration of catalytic reaction and separation in novel concepts. Link: Methodology to perform LCA on a novel Shvo-type hydrogenation catalyst on lab scale. *Learn more here: https://www.biorizon.eu/news/green-chemistry-campus-tenants-move-forward-with-bio-aromatics-research*
H2020-MOF4AIR	Objective: To develop performing adsorption MOFs for efficient carbon capture.

(2019-2023) MOF4AIR	Link: Methodology for MOFs synthesis and choice based on their properties. MOF study. Mechanistic study and modelling of MOFs. *Learn more here: https://www.mof4air.eu/*
H2020-MENACE-CO2 (2021-2023)	Objective: Synthesis of clusters of Co mimicking metalloenzymes to be used as catalysts in the electrochemical CO_2 reduction to methanol. Link: Both photocatalytic processes, water splitting and CO_2 reduction, have in common the oxygen evolution reaction that should occur with the highest possible efficiency. *Learn more here: https://cordis.europa.eu/project/id/894270*
H2020-SOLAR2CHEM (2020-2024) SOLAR 2 CHEM	Objective: International training network on photocatalysis for solar fuels production. Link: METHASOL will develop international exchanges of students and co-workers between Europe and China. *Learn more here: https://www.solar2chem.eu/*
H2020-LOTER.CO2M (2018-2020) LOTER CO2M	Objective: CRM-free low temperature electrochemical reduction of CO_2 to methanol and oxygen evolution reaction. Link: As in METHASOL, methanol is targeted in LOTER.CO2M, it will use oxygen evolution reaction and carried out without CRM. Therefore, the results and current research activities of LOTER.CO2M are of much interest on the co-operation of CO_2RR to methanol and OER. *Learn more here: https://www.loterco2m.eu/*
Spanish national project. MINECO. RTI2018- 099482-A-I00 (2019-2021)	Objective: Photocatalytic water decomposition assisted by visible light using novel and multifunctional UiO-66/67 materials. Link: Results can be used to tune the electronic properties of MOFs to enhance the CO_2 reduction upon visible light irradiation. *Learn more here: https://m-era.net/joint-calls/joint-call-2016/participating-countries-regions-call-2016/spain-programmes/spain-mineco*
Spanish national project. FRA-2016 (2017- 2021)	Objective: Metal-organic frameworks as heterogeneous photocatalysts for CO_2 reduction and H_2 generation using H_2O. Link: Results can be used to develop MOFs as heterogeneous photocatalysts for the reduction of CO_2 and generation of hydrogen using H_2O.

LU Jiaxi International Team Program	Objective: Innovative research team of photocatalytic/photoelectro-catalytic reduction of CO_2 systematic investigation: international collaboration with several teams with China, finishing in 2021. Link: The international collaborations developed in this framework will be strengthened by METHASOL.
H2020-SUN2CHEM (2020-2023) SUN2CHEM	Objective: Develop solutions to achieve efficient solar-driven CO_2 reduction, targeting ethylene as the final product. Link: Investigation of photocatalysts for the CO_2RR, use of Cu co-catalysts. *Learn more here: https://www.sun2chem.eu/*
MOST China (2019-2023)	Objective: To develop efficient solar water splitting devices for hydrogen generation. Link: The knowledge in rector design developed in the project can be useful in METHASOL for the fabrication of photocatalytic reactors for CO_2 reduction.
National Natural Science Foundation of China, Grant No. 21633015 (2017-2021) 国家自然科学基金委员会 National Natural Science Foundation of China	Objective: This project (NSFC, 21633015) is intended to develop the spatial-temporal resolved spectroscopic methods, and to apply these methods to investigate the photogenerated carriers, charge separation and transportation and their final interfacial reactions for photocatalytic semiconductor materials. Link: The developed spatial-temporal resolved spectroscopic methods will be applied in this project. *Learn more here: http://www.nsfc.gov.cn/english/site_1/index.html*
National Natural Science Foundation of China, Grant No. 21872143 (2019-2022) 国家自然科学基金委员会 National Natural Science Foundation of China	Objective: This project (NSFC 21872143) will characterise the photogenerated charge dynamics for water oxidation reaction to understand the water oxidation mechanisms. Link: The experience in water oxidation mechanism in aqueous solution will help to understand the photocatalytic mechanism in gas phase. *Learn more here: http://www.nsfc.gov.cn/english/site_1/index.html*

4. NEWSLETTER

SUBSCRIBE TO OUR NEWSLETTER!

Don't miss any update from our project: publication of results, participation in events, organisation of webinars. Newsletters will be sent approximately every 3 months.

[Form to be filled in with first name, last name, email address, language + "Subscribe" button]

OUR ALREADY PUBLISHED NEWSLETTERS

[Links to already published newsletters]

CONTACT

[Refers to the homepage, the "Join us anytime" form – see 0.]

PRIVACY POLICY

INTRODUCTION

The following gives a simple overview of what happens to your personal information when you visit our website. Personal information is any data with which you could be personally identified. Detailed information on the subject of data protection can be found in our privacy policy below.

Notice concerning the party responsible for the website

EUROQUALITY

8 rue de l'Isly

75003 PARIS

FRANCE

Contact details & partners: see Imprint

METHASOL consortium, represented by the Coordinator: see Imprint

Data Protection Officer

Universitat Politecnica de Valencia (UPV) – Coordinator of METHASOL

contact@methasol.eu

Camino de Vera, 46022 Valencia

(+34) 96 387 70 00

https://www.upv.es/index-en.html

GENERAL INFORMATION ON DATA PROTECTION

Data processing when visiting websites

When visiting a website, data is being collected automatically – also personal data. This is necessary from a technical standpoint to make your website visit possible in the first place and offer you the best results.

Every time you visit a website, retrieve an image from a server, load an external script or plugin or stream a video, or use any other transmission possibility, your device transmits data to the server, from which you retrieve information. When opening a website, your browser (e.g. Firefox, Internet Explorer, Edge, Opera, Safari) automatically sends certain information from your system. These information are, e.g.:

- Browser type and browser version
- Operating system used
- Referrer URL
- Host name of the accessing computer
- Time of the server request
- IP address of website or file retrieved
- Status of website access (data transmitted, error code)
- Amount of data transmitted
- Keyboard layout (language)
- Screen resolution
- Name of website or file retrieved

[To be adapted to the effective information collected]

The following data are being logged by every server. This is done for:

- Adherence and review of IT-Security (e.g. identification of hacker attacks) and IT-Operation
- Statistical Evaluation (on use of website)
- Website Improvement
- Providing a modified version of the website or files, for optimized display on your device

[To be adapted to the effective information collected]

Security Protocols do not work with pseudonymisation and anonymisation, as this would not allow any conclusions as to who potential attackers could be. Generally, the evaluation of data, is anonymised and no profiling takes place. More information can be found further below.

Affected Person

The "affected Person" is the person, whose personal information is gathered and processed. In the following, the affected person will also be called "Website Visitor" or "User".

Information on rights of Affected Persons

Any affected person can assert their rights vis-à-vis the responsible party. This can be done via e-mail, mail, or a specific form, provided for that matter. Requests by phone are possible too. However, they will only be accepted via phone, but responded via postal mail or e-mail, or other means. Such requests

concerning Affected Persons' rights, are free of charge. If the right to such requests is exerted excessively, fees can be raised. Answers to these requests will be sent within the mandatory period of one month. This period can be extended in exceptional cases (e.g. high number of requests or high complexity of requests). The extension of this response period must be justified however. In the following, the affected rights are listed.

- Right to information
- Right to correction
- Right to deletion
- Limitation of data processing
- Right to data portability
- Revocation of consent to the processing of data
- Right to object
- Right to file a complaint

The affected person must authenticate himself / herself vis-à-vis the responsible company to prove that he / she is entitled to exert his / her rights.

COOKIES

We use so-called "session cookies." They will be automatically deleted after your visit. Other cookies we use remain in your device's memory until their expiration date. For more information, see Cookie Policy.

ENCRYPTION OF THE WEBSITE

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FORMS

Newsletter

We do not send a newsletter in order to sell products or services.

You have the opportunity to subscribe to a free-of-charge newsletter on our website. With your subscription, the data from the subscription form will be forwarded electronically to us.

The legal basis for data processing with consent is Art. 6 (1) lit. a GDPR.

The processing of personal information from the newsletter form is solely for delivering the newsletter. Any other data that is being gathered during the subscription process serves for protection against abuse of the service and the used e-mail address.

The personal data will be deleted when it is no longer needed for the delivery of the newsletter. Thus, the data will only be stored for the time of the subscription. At the latest, 14 days after the cancellation of the subscription, the information will be deleted.

STATISTICAL TOOLS

See Google Analytics in the Legal Notice

FURTHER DATA PROCESSING

[LinkedIn, Twitter]

COOKIE POLICY

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This Cookie Policy explains what cookies are and how we use them, the types of cookies we use i.e, the information we collect using cookies and how that information is used, and how to control the cookie preferences. For further information on how we use, store, and keep your personal data secure, see our Privacy Policy.

You can at any time change or withdraw your consent from the Cookie Declaration on our website Learn more about who we are, how you can contact us, and how we process personal data in our Privacy Policy.
Your consent applies to the following domains: www.methasol.eu

WHAT ARE COOKIES?

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As most of the online services, our website uses first-party and third-party cookies for several purposes. First-party cookies are mostly necessary for the website to function the right way, and they do not collect any of your personally identifiable data.

The third-party cookies used on our website are mainly for understanding how the website performs, how you interact with our website, keeping our services secure, providing advertisements that are relevant to you, and all in all providing you with a better and improved user experience and help speed up your future interactions with our website.

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Essential: Some cookies are essential for you to be able to experience the full functionality of our site. They allow us to maintain user sessions and prevent any security threats. They do not collect or store any personal information. For example, these cookies allow you to log-in to your account and add products to your basket, and checkout securely.

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LEGAL NOTICE

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[Add the Newsletter form]