Horizon Europe Launch Event

SOCAR TURKEY ARAŞTIRMA GELİŞTİRME ve İNOVASYON A.Ş.

(SOCAR AR-GE)

- My Story in Horizon 2020-

İstanbul, 22 March 2022

TURKEY in HORIZON 2020
COOPERATION, INNOVATION, COMPETITIVENESS

This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

UFUK AVRUPA
TÜBİTAK

Tuğçe Oturakkaya

R&D Incentive Chief Engineer

SOCAR
AR-GE

tugce.oturakkaya@socar.com.tr

TURKEY in HORIZON 2020
COOPERATION. INNOVATION. COMPETITIVENESS

This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

UFUK AVRUPA
TÜBİTAK

SOCAR GLOBAL

51 thousand
Approximate number of employees

7,7 million tons
Oil production in 2018
Total Azerbaijan production: 37.5 million tons

6,8 billion m³
Natural gas production in 2019
Total Azerbaijan production: 35.6 billion m3

7 billion barrels
Proven oil reserves in Azerbaijan

2,6 trillion m3
Proven natural gas reserves in Azerbaijan

TURKEY in HORIZON 2020
COOPERATION. INNOVATION. COMPETITIVENESS

This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

UFUK AVRUPA
TÜBİTAK

This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

Strategic Alignment with SOCAR 2035 Vision

SOCAR GLOBAL	SOCAR TURKEY	SOCAR R&D
Digitalization: Increasing the efficiency of operations with the application of **high-level digitalization** in all segments of SOCAR's value chain	**Support for process improvements by digital solutions, modeling projects**	Operational Efficiency (Catalyst & Digitalization)
Efficiency and Optimization: Creating value by applying the latest technological and innovative solutions to SOCAR's operations and activities	**New product development, grade diversification, product improvement**	Product & Application
Business Sustainability: Providing new sources of income through investments in innovation and venture		
Energy Transition: Contributing to global sustainability through low carbon emissions, circular economy and development of environmentally friendly operations	**Creation of long-term competitive materials and applications**	Energy Transition & Circular Economy & Environmental Solutions

TURKEY in HORIZON 2020
COOPERATION. INNOVATION. COMPETITIVENESS

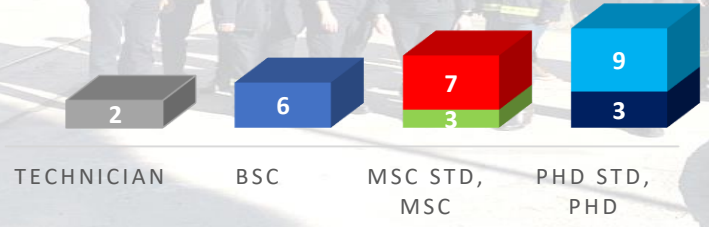
This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından

UFUK AVRUPA
TÜBİTAK

R&D FROM 1970 TO PRESENT

PETKIM R&D Center Status
14 Jan 2015
SOCAR TURKEY R&D Center Status
12 Jun 2020

SOCAR R&D PERSONNEL



- Chromatography Laboratory
- Catalyst Laboratory
- Rheology Laboratory

Established in 1200 m² area
- Pilot plant
- Offices
- Laboratories

- Environment and Biotechnology Laboratory
- Polymer Characterization Laboratory
- Chemical Analysis Laboratory

This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

Funded International Projects of SOCAR

Acronym	Project Name	Coordinator	# of Partners
CARMOF – **(H2020)**	TAILOR-MADE 3D PRINTED STRUCTURES BASED ON CNT AND MOF MATERIALS FOR EFFICIENT CO2 CAPTURE	AIMPLAS	16
CO2Fokus – **(H2020)**	CO2 UTILISATION FOCUSED ON MARKET RELEVANT DIMETHYL ETHER PRODUCTION, VIA 3D PRINTED REACTOR- AND SOLID OXIDE CELL BASED TECHNOLOGIES	VITO	13
NEFERTITI – **(H2020)**	INNOVATIVE PHOTOCATALYSTS INTEGRATED IN FLOW PHOTOREACTOR SYSTEMS FOR DIRECT CO2 AND H2O CONVERSION INTO SOLAR FUELS	ACONDICIONAMIENTO TARRASENSE ASSOCIACION	10
LOUISE – **(H2020)**	Low-Cost CO2 Capture by Chemical Looping Combustion of Waste-Derived Fuels	Darmstadt University	9
Circular TwAIn – **(HEUROPE)**	AI Platform for Integrated Sustainable and Circular Manufacturing	Engineering - Ingegneria Informatica Spa	21

TURKEY in HORIZON 2020
COOPERATION, INNOVATION, COMPETITIVENESS

This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

NEFERTITI

UFUK AVRUPA
TÜBİTAK

Project Name:	NEFERTITI-Innovative photocatalysts integrated in flow photoreactor systems for direct CO2 and H2O conversion into solar fuels
Start & End Date:	01.July.2021 – 30.June.2025
Coordinator	ACONDICIONAMIENTO TARRASENSE ASSOCIACION
Project Budget	3.844.427,50 €
SOCAR Budget	388.987,50 €
Supported Programme	H2020- BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE: SECURE, CLEAN AND EFFICIENT ENERGY
Bakground	Reduction of CO2 emissions (76% of total greenhouse gases) is the key action towards reaching the carbon neutral industry and achieving the ambitious goals set by the Paris Agreement such as keeping global warming lower than 2 °C above pre-industrial era
The Problem & Solution	CO2 emissions due to conversion of various fossil fuels into energy contribute highly to global warming while the need for energy, therefore fuels, still increases. Photocatalysis, photoelectrocatalysis have potential to significantly contribute to achieving the aforementioned ambitious goals by being low-cost, easily tunable and having longer life time than their counterparts.

TURKEY in HORIZON 2020
COOPERATION. INNOVATION. COMPETITIVENESS

This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

UFUK AVRUPA

Project Name:	NEFERTITI-Innovative photocatalysts integrated in flow photoreactor systems for direct CO2 and H2O conversion into solar fuels
Our Strategy	NEFERTITI aims to develop an efficient photocatalytic process, combining conversion of CO2 and water into synthesis gas and towards solar ethanol via C-C bond formation reaction.
Challenges	Low efficiency and stability issues of photocatalytic processes The difficulty of maintaining a continuous once-through chemical process. High cost of photoelectrocatalytic systems components
Impact	Potential to create a solar ethanol market in Europe like bioethanol being widely used in Brazil Potential to reach a cost-competitive system by powering up only by the Sun Potential to reach big masses due to the multicontinental nature of the consortium (USA, Europe, China)
Background and Context (the overall aim of the project etc.)	Designing and operating a continuous photocatalytic system to convert CO2 and H2O to synthesis gas in the first step and to solar ethanol in the second by artificial photosynthesis and C-C bond formation reaction, respectively.
Scientific Output(s)/ Product(s)	A two back to back photocatalytic reactors for artificial photosynthesis of CO2 and H2O and C-C formation reactions that work continuously for solar ethanol production

TURKEY in HORIZON 2020
COOPERATION, INNOVATION, COMPETITIVENESS

This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

CO2FOKUS
ADVANCING CO2 CONVERSION

UFUK AVRUPA
TÜBİTAK

Project Name:	**CO2Fokus-CO2 utilisation focused on market relevant dimethyl ether production, via 3D printed reactor- and solid oxide cell based technologies**
Start & End Date:	01.July.2019-30.June.2023
Coordinator	VITO
Project Budget	3.994.950,00 €
SOCAR Budget	296.000 €
Supported Programme	H2020- Secure, clean and efficient energy
Bakground	The goals of the Paris Agreement present the need for an immediate action on the capture and utilization of CO2 to decrease emissions from all industries
The Problem & Solution	CO2 emissions due to conversion of various fossil fuels into energy contribute highly to global warming while the need for energy, therefore fuels, still increases Utilizing emitted CO2 via energetically but especially environmentally more efficient chemical processes to create alternative fuels that emit significantly lower CO2 when converted into energy

Project Name:	CO2Fokus-CO2 utilisation focused on market relevant dimethyl ether production, via 3D printed reactor- and solid oxide cell based technologies
Our Strategy	CO2Fokus aims the direct catalytic conversion of CO2 into an alternative fuel dimethyl ether (DME) which has low toxicity, high cetane number and better combustion quality than its fossil counterparts. To achieve this, CO2Fokus aims to benefit from 3D printing technologies for the design and manufacture of the tubular, multi-channel reactor, solid oxide electrolysis for the production of hydrogen as a reactant and integrating and validating the whole system on pilot scale under site specific conditions
Challenges	High cost of current CCU technologies and applications at scale Low stability, yield and selectivity of the catalyst w/ high masses needed for application Lack of policies for fuels produced made of captured CO2
Impact	Offering a direct recycling and reaction route on site for CO2 to DME Creating new markets with produced DME for carbon-intensive regions Contribution to circular economy targets
Background and Context (the overall aim of the project etc.)	CO2Fokus aims to develop a catalytic reaction and solid oxide electrolysis system for economical and environmentally viable direct conversion of CO2 into dimethyl ether (DME).
Scientific Output(s)/ Product(s)	A portable sytem of direct catalytic conversion of CO2 into DME consisting of CO2 purification, heating and compression with a solid oxide electrolyzer for the green production of hydrogen from water and a 3-D printed multichannel reactor

TURKEY in HORIZON 2020
COOPERATION, INNOVATION, COMPETITIVENESS

This project is co-financed by the European Union and the Republic of Turkey
Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

UFUK AVRUPA
TÜBİTAK

Tuğçe Oturakkaya

R&D Incentive Chief Engineer

SOCAR
AR-GE

tugce.oturakkaya@socar.com.tr