

R&D COLLABORATIVE PROPOSAL / **COMPANY PARTNER SEARCH**

The information you are about to provide in this form will be distributed among Spanish companies matching your company profile and that might be interested in the proposal of collaborative R&D project that you will be describing in this form. (Please use English language for filling in the document)

In the case that your company will establish a R&D project in collaboration with a Spanish company, you could present a Joint Project Proposal to the CHINEKA Program.

YOUR ENTITY PROFILE

Name: University of the Basque Country

Number of employees:

Annual turnover:

Balance Total:

Year of latest financial report:

Address: Avda Tolosa 72

City: San Sebastiaian

Province: Gupizcua

Postal Code: 20018

Telephone:

Fax:

Email:

WEB site:

Contact: Radmila Tomovska

Position: Ikerbaque Research Professor

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Additional Contact:

Position:

Telephone:

Email:

COLLABORATIVE R&D PROJECT PROPOSAL

(Describe as precisely as possible the technology cooperation proposal. Describe what you have to offer and what you expect from your potential partner) Include: Sector Group; Abstract of Project; Innovations Offered; and Current State of Development

Title	Polymer supported MXene-based membrane photocatalyst for photocatalytic CO ₂ reduction to C ₂₊ products		
Duration (YM- YM)	2021, September -2024, September		
Budget(1,000 Euro)	SPAIN	CHINA	TOTAL
Technology Field (Click a box)	<input type="checkbox"/> Smart Cities <input type="checkbox"/> Production Technologies, <input type="checkbox"/> Biomedicine and Technologies for Health, <input checked="" type="checkbox"/> Environment technologies <input checked="" type="checkbox"/> Clean Technologies <input type="checkbox"/> Modern Agriculture <input checked="" type="checkbox"/> Advanced Materials. <input type="checkbox"/> Others		
Summary	<p>The greenhouse effect caused by the massive emission of carbon dioxide (CO₂) has seriously threatened the sustainable development of human society. Semiconductor photocatalyst photocatalytic reduction of CO₂ to carbon-based compounds can effectively reduce the concentration of CO₂ in the atmosphere, but the selectivity of CO₂ reduction to high-value-added carbon-based products, such as ethanol and ethylene (C₂₊ products), is low, which limiting the development of photocatalytic CO₂ reduction technology. Based on the electronic conductivity, abundant active sites and photothermal effect of MXene, intramembrane channel adjustability of MXene and advantages of membrane photocatalyst, this project intends to construct MXene/semiconductor membrane photocatalyst to strengthen CO₂ activation and C-C coupling reaction, thus improve the yield of C₂₊ products.</p> <p>To give robustness to the photocatalyst and to increase the probability of stable cycle operations and re-use, polymer substrates will be developed as a support to the MXene/Semiconductor membrane photocatalysts. For that</p>		

aim, miniemulsion polymerization will be employed to develop conjugated polymer particles based on dibenzo[b,d]thiophene sulfone. The polymer particles are characterized with high surface-to-volume ratio, with tailored properties during synthesis that allow tuning of optoelectronic and physico-chemical properties. By establishing the interaction of MXene-based photocatalysts and the conjugated polymer nanoparticles, not only the inorganic material will be physically supported but, as well, the photocatalytic activity will be enhanced throughout creation of charge transfer complex and synergy in the photocatalytic actions.

It is planned to use a combination of experimental research and theoretical simulation calculation to deeply study the adsorption and activation characteristics of CO₂ on the membrane photocatalyst, the reaction process of CO₂ reduction, and the mass transfer mechanism of reactants and products in the membrane photocatalyst, investigate the effects of membrane thickness, intramembrane channels and functional groups on the efficiency of photocatalytic CO₂ reduction, reveal the C-C coupling reaction mechanism between the CO₂ reduction intermediates and the reaction-separation mechanism of photocatalytic CO₂ reduction, provide theoretical guidance for the construction of MXene-based membrane photocatalyst with high efficiency, high selectivity and high stability.

SPANISH PARTNERS

(When you know a potential Spanish company, write its name and contact details in this section) Please, make a description of the desire type of Spanish Technology Partner.

YOUR ENTITY DESCRIPTION

(Entity Website, Research and development guidelines, strategic alliances, competitive position, etc)

(The minimum information to show the potential of your company)

Universidad Del Pais Vasco/Euskal Herriko Unibertsitatea (UPV/EHU), Spain



CAMPUS OF
INTERNATIONAL
EXCELLENCE

POLYMAT

Following our motto 'Give and spread knowledge', the **University of the Basque Country** is an integrating institution willing to produce knowledge, experience and research in order to forward them to the general public. Our courses catalogue consists of 67 Bachelor's Degrees in all fields of knowledge. At postgraduate level, we offer 103 official master programmes, 44 professional & expert diplomas and 71 PhD programmes. The region's success and scientific and technological progress are underpinned by the University of the Basque Country, a vibrant 30-year-old institution with 45,000 students, 5,000 world-class academic staff and state-of-the-art facilities.

Polymat at the University of the Basque Country (EHU) in San Sebastian, is an internationally reputed university research Institute in Polymer Materials. Institute of Polymer Materials (POLYMAT) includes 21 Assistant, Associate and Full Professors and more than 50 PhD students and postdoctoral fellows. Within POLYMAT, the Polymerization Processes Group (PPG) is composed of 6 academic staff, 4 postdocs, and 25 PhD students with world-class reputation for the synthesis, characterization and modeling of high performance waterborne polymer dispersions. This is an international research team that in the last years has hosted Ph.D. students and postdocs from 15 countries. They are experts in Polymerization Reactions and Engineering and have directed their research to the fundamental investigation of industrially significant problems with special emphasis on polymerization in dispersed media.

Research team:

Prof. Radmila Tomovska (female), PI is a chemical engineer and Dr.Sc. (1999) from the Faculty of Technology and Metallurgy, University St Cyril and Methodius, Skopje, North Macedonia. Since beginning of 2009, Dr. Tomovska obtained a position of Ikerbasque researcher professor at the POLYMAT Institute, University of the Basque Country. Her main field of research is synthesis of polymers and composites in dispersed media for different application, photocatalysis in environmental application, (CO₂ capture and adsorption, water purification). The research is supported with regional, national and international grants, with strong support from industry. Currently she is supervising six PhD theses and is co-author of more than 70 publication between them 2 review articles, and 6 book chapters.

Prof. Jose Ramon Leiza (male), Dr.Sc. from University of the Basque Country in 1991, Director of Institute for Polymer Materials POLYMAT since 2011. In 1992 he obtained a position as assistant professor in the Department of Applied Chemistry of the University of the Basque Country. In 1994 he spent a one year post-doctoral stay as research associate at the Emulsion Polymers Institute of Lehigh University (Bethlehem, PA, USA) under the supervision of Prof. M.S. El-Aasser. In 2004 he spent a sabbatical year at Queen's University (Kingston, On, Canada). In 2010 he was promoted to full Professor at the University of the Basque Country. In 1993 he received the Rhone-Poulenc award in Clean Technologies organized by the Association of Engineers of Madrid (Spain). His current research interests are focused on the following topics: waterborne polymer/inorganic hybrid nanocomposites, polymer reaction engineering aspects of polymerization in dispersed media (kinetics, modeling, high solids content formulations), renewable resource monomers. He has published more than 140 papers, 16 book chapters and has coauthored 5 patents. He is member of the editorial board of the Macromolecular Reaction Engineering and International Journal of Polymer Science journals.

Guangxi University (GXU), P. R. China



廣西大學
GUANGXI UNIVERSITY

Guangxi University was founded in 1928. The first president was Dr. Junwu Ma, a celebrated educator, scientist, and democratic revolutionist in China. In 1997, Guangxi University and Guangxi Agricultural University were consolidated into new Guangxi University. Guangxi University was designated as a “211 Project” university in 1999 and approved to be a cosponsored university by Ministry of Education and Guangxi Zhuang Autonomous Region Government in 2004. Today, Guangxi University has developed into a region-featuring research university with 30 colleges. It has 97 undergraduate majors, 36 primary disciplines and 171 sub-disciplines in master degree, 8 primary disciplines

and 45 sub-disciplines in doctoral degree station, and 7 postdoctoral research centers. The university has 2,006 full-time teachers, including over 400 professors, more than 700 associate professors, 125 Ph. D, supervisors, and 1,328 master supervisors. There are 23,649 full-time undergraduate students and 6,669 full-time postgraduate students in Guangxi University. In addition, the number of international students from over 30 nations and vocational education students totals 800 and 20,000, respectively.

School of Chemistry and Chemical Engineering: Guangxi University is one of the oldest colleges in China. The Chemistry Department can be traced back to 1932, and the Department of Chemical Engineering was founded in 1940. Then, these two departments were amalgamated into School of Chemistry and Chemical Engineering in 1962. The School of Chemistry and Chemical Engineering is now composed of four departments: Chemistry, Applied chemistry, Energy and chemical engineering, and Chemical Engineering. The school has 138 faculty members. Among them, there are 2 double employed academicians, 2 Guangxi special experts, 52 full professors, 37 associate professors, and 106 full-time teachers. The school has about 1,900 students, including 500 Master Degree and Ph.D. candidates. In School of Chemistry and Chemical Engineering, Environmental-Friendly Chemical Engineering Lab (EFCEL) is composed of 6 academic staff (including Prof. Hongbing Ji, Prof. Yuexiu Jiang, Dr. Xuan Luo, Dr. Xinling Xie, Dr. Tongming Su, and himself), 3 Ph.D. students, 16 postgraduates, and it is directed by Prof. Qin. The current research of the EFCEL focuses on the environmental-friendly catalytic processes and synthesis/separation of fine chemicals. This is an international research team and all the academic staffs have the experience of living and studying abroad. They are experts in catalysts synthesis, catalysts characterization, and catalytic reaction. The EFCEL is equipped with photocatalytic reactors to perform the photocatalytic reaction and the instruments to analyze the product and characterize the photocatalysts (such as the GC, FTIR, DSC, UV-vis DRS, and PL). In addition, the School of Chemistry and Chemical Engineering has the other instruments to support our research, such as the NMRs, XRD, XPS, TEM, AFM, SEM, Physisorption analyzer, electrochemical workstation, etc.

In the frame of this proposal, GXU will be responsible for development of optimal building blocks for synthesis of 3D sponge materials, including the synthesis of 2D materials MoS₂ WS₂, GaN, CdS, ZnO, CeO₂ and their thorough characterizations, the synthesis of polymer nanoparticles, their functionalization and characterization, and the synthesis of GO/2D crystals and modulation of the interface. EFCEL was a strong tradition in the synthesis of 2D materials, polymer, and composite material (proven by the research track and the research project). Thus, the EFCEL members have extensive experience in the synthesis and design of 2D materials, polymer and composites.

Research team:

Prof. Zuzeng Qin (male), is a professor in School of Chemistry and Chemical Engineering at Guangxi University. He received his Ph.D. in the School of Chemistry and Chemical Engineering from Guangxi University in 2009. After completing his Ph.D., he was an associate professor (2011) and professor (2014) at Guangxi University. He carried out his postdoctoral research at Sun Sat-Sen University in China from 2012 to 2015. From 2015~2016, Dr. Qin went to the University of Tennessee-Knoxville as a visiting scholar. His research interests are environmental-friendly catalytic processes and synthesis/separation of fine chemicals. And his current research focuses on catalytic conversion of CO₂ strengthened by plasma; (2) Heterogeneous catalytic ozonation for selective oxidation of cinnamon oil to benzaldehyde. Currently, he is supervising 8 postgraduates and 2 Ph.D. students, and

is a co-author of 3 book chapters and around 69 articles.

Assistant Professor Tongming Su (male): Tongming Su obtained his Ph.D. in industrial catalysis from Guangxi University, China in 2018. He is currently an Assistant Professor at the School of Chemistry and Chemical Engineering, Guangxi University, China. His research interests focus on nanomaterials synthesis and their applications in catalysis, energy conversion and environmental remediation.◦

YOUR ENTITY PRODUCTS
(Technologies, applications, services, etc)

(The minimum information to show the potential of your company)