

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: Universidad Autónoma de Madrid

Number of employees:

Annual turnover:

Balance Total:

Year of latest financial report:

Address: Ciudad Universitaria de Cantoblanco

City: Madrid

Province: Madrid

Postal Code: 28049

Telephone:

Fax:

Email:

WEB site: www.uam.es

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Position: Associate Professor

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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	Enhancement of photocatalytic oxidation efficiency for the treatment of highly-salty organic industrial wastewater		
Duration (YM- YM)	3 Years		
Budget(1,000 Euro)	SPAIN	CHINA	TOTAL
	175€	Around 416 € (3,000,000 RMB)	591 €
Technology Field (Click a box)	<input type="checkbox"/> Smart Cities <input type="checkbox"/> Production Technologies, <input type="checkbox"/> Biomedicine and Technologies for Health, <input type="checkbox"/> Environment technologies <input checked="" type="checkbox"/> Clean Technologies <input type="checkbox"/> Modern Agriculture <input type="checkbox"/> Others		
Summary	<p>Our sector group is the research on Water Treatment by using Photocatalysis, an environmentally friendly technology able to use solar light as sustainable and clean energy source.</p> <p>The aim of this project is the development of solar photocatalytic systems for the degradation of polybrominated diphenyl ethers (PBDEs), which are series of brominated flame-retardants. PBDEs seriously threaten the water quality and ecological safety of rivers and lakes, being urgent the enhancement of new ways for its degradation. For that, it is mandatory to study in-depth the degradation mechanisms and control product toxicity.</p> <p>For this project we collaborate with Beijing Institute of Technology (BIT) and we offered the following innovations to develop this proposal:</p> <ol style="list-style-type: none"> 1. Density functional theory (DFT) for rational catalyst design, centred the attention on developing novel biochar loaded with multi-element modified TiO₂ magnetic systems. 2. Capacity to follow and understand the active species that control the PBDEs degradation by means of quenching tests and ESR detection. 3. Capacity to explore the action of real water parameters such as heavy metals and halogen ions. 4. Determination of PBDEs and by products toxicity by E. coli inactivation, EC50, BOD5/COD determination, and microbial breathing experiments. 5. Test the effectiveness of the developed solar-driven systems with real polluted river and lake waters from both China and Spain. <p>We are currently working on the develop of solar photocatalytic systems for the degradation of different Emerging Pollutants, resulting in promising systems with high stability and activity under continuous stream. Thus, we and our partners in China have experience in Clean Technologies for Water Treatment.</p>		

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.

We look for a Spanish Technology Partner involved in Water Treatment, interested in the develop of Solar photocatalysis as a promising technology.

YOUR ENTITY DESCRIPTION

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

Our group belongs to the Department of Chemical Engineering at Autonomous University of Madrid (UAM):

https://www.uam.es/Ciencias/Seccion_IngQuimica/1446743210306.htm?pid=1242664085038. The Autonomous University of Madrid is part of the Campus of Excellence together with several CSIC entities, which has reinforced its leading position in the world's benchmark rankings, being currently the first Spanish university in the QS World University Ranking 2022.

Our research group has experience on research fields dealing with photocatalysis science and photocatalytic reactors engineering, environmental and energy technologies related to wastewater treatment and water splitting using solar light, and characterization of materials with special attention to electrochemical techniques. Our group is made up of four Associate Professor, three national and international PhD researchers and four PhD students from Spain and China.

Our research team usually applies to different cooperative and international projects and collaborate with international scientists. We have established strategic alliances with China, through the host programs from China Scholarship Council, with USA (Cincinnati University), Mexico (IPICYT) and Peru (Lima university) through international collaboration projects funding by Banco Santander-UAM programs. We have just participated in the Marie Curie call as supervisors of PhD researchers. We have also acquired a competitive position in Spain receiving funds from the State Investigative Agency through competitive calls. We have also established alliances with a Spanish enterprise through Technology Transfer Programs and contract signature. In the past six years, our scientific research fund reaches more than 0.5 million euros and Nearly 15 SCI papers are published every year. We are also involved in Editorial tasks as Editors of international journals with high impact factor, Chemical Engineering Journal (<https://www.journals.elsevier.com/chemical-engineering-journal/editorial-board/carolina-belver>) and Separation and Purification Technology (<https://www.journals.elsevier.com/separation-and-purification-technology/editorial-board/jorge-bedia-phd>).

We have built an alliance with Beijing Institute of Technology (BIT), our partner for this CHINEKA proposal. We were invited to attend online forum and gave speeches on water treatment technologies for students of BIT. BIT the first science and engineering university was founded in Yan'an in 1940. It has been one of the key universities in China since the founding of New China and the first batch of universities which has entered the national "211 Project", "985 Project" and the "Top A World-class University". The university is now affiliated to the Ministry of Industry and Information Technology. BIT ranks 151-200 in 2021 Academic Ranking of World Universities (ARWU) and 373 in 2022 QS World University Ranking 2022.

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

In last years, thanks to competitive R&D&I project and other projects with companies, the laboratories of the Chemical Engineering Department of the UAM have acquired the equipment to perform most of the activities considered in the project proposal, including the synthesis, characterization and testing of the materials in the photocatalytic processes investigated for water purification and hydrogen production.

We have the setups needed for the synthesis of photocatalysts, such as conventional and microwave heating, solvothermal synthesis and sol-gel. Similarly, most of the characterization techniques are available in the Chemical Engineering Department or in the "Interdepartmental Investigation Service (SIDI)" of the UAM (<https://www.uam.es/uam/sidi>). Including an electrochemical workstation for the characterization of some key features of the photocatalysts that will provide information about charge separation and recombination. The characterization techniques not available in UAM are available at the central services of other universities. For instance, SEM and TEM are available at University of Zaragoza or XPS that can be performed in the University of Extremadura.

We have also the equipment required for testing the activity and stability of photocatalysts under solar light. Two solar chambers are available to carry out the reaction under solar light, controlling reaction temperature and intensity of irradiation. We have a Liquid chromatograph (HPLC) for quantification of pollutants in water and a Gas chromatograph (GC) We have also access to other analytical techniques, such as Total Organic Carbon detector, for checking the mineralization of the pollutants, and Ionic chromatograph to study the effect of ionic species during the water treatment process.

Thanks to our Chinese partner we have access also to other techniques for understanding the mechanism of the degradation process, and to evaluate the toxicity of both real and treated wastewaters by inactivation of E. coli, with access to bacteria testing equipment.