



UNIVERSITY: Public University of Navarra (UPNA)

WIT AREA:

Automotive, Mechatronics and Advance Manufacture

Health

Energy

IA

WIT PROGRAMME'S RESEARCH LINE NAME: 2D-Nanostructure for Therapy Application

DOCTORAL PROGRAMME: [Doctorate in Synthetic and Industrial Chemistry](#)

COMPLETE DESCRIPTION OF THE LINE

This interdisciplinary project aims to provide the fundamental knowledge of the novel noninvasive multimodal therapeutical system for the treatment of cervical cancer based on highly biocompatible multifunctional 2D-nanostructures. Cervical cancer is among the leading causes of cancer-related deaths in women worldwide. Therefore, there is a necessity to develop more efficient anti-cervical cancer therapy with minimum side effects for a patient that will act locally.

So far, a combined therapeutical approach that act locally were applied against cervical cancer, but the advantages of a combining photodynamic therapy (PDT) and chemotherapy have not been exploited. PDT and hyperthermia utilize inner properties of nanoparticles with photosensitivity properties; they can be used for controlled and targeted therapy and drug delivery, by using external stimulus (light). The advanced hybrid system that will be developed during this project will be based on 2D carbon-based nanomaterials (graphene or graphene oxide) that will serve as a vehicle for metallodrug.



Carbon-based nanomaterials are highly biocompatible, biodegradable, and have numerous possibilities for surface modification. However, among hundreds of compounds/nanocarriers fabricated weekly, it is not easy to select those capable of proceeding towards near-to-human applications. Therefore, it is of utmost importance to collect detailed knowledge about their properties and mechanisms of action. This proposal offers to the scientific and broader community to fill the pool of knowledge with the data related to the materials properties and their biological effects pointing towards their potential in medical applications.

To achieve these goals, the researchers from UPNA supported with a well-established network of national and international collaborators will unify their expertise and resources. Several institutions will be involved in the project, to support it such as ALBA Synchrotron in Barcelona and Serbia (VINČA Institute of Nuclear Sciences), which cover all scientific areas necessary for the project success: material science/nanotechnology, chemistry, and biochemistry.

RESEARCH GROUP NAME:

Environmental Technologies and Applications (TAMA)

COORDINATOR:

- Gil, Antonio / Tutor proposal: Algarra, Manuel
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MEMBERS OF THE LINE RESEARCH:

Dr Antonio Gil, Full Professor. Chemical Engineering.



Dr Sophia A. Korili, Associate Professor, Chemical Engineering.

Dr Manuel Algarra González, INAMAT² Senior Research.

Dr Eluxka Almandoz. Assitant Professor.

Dr Leticia Santamaría Arana, Post-doctoral researcher. Margarita Salas
Programme.

Dr Elissa Gabriela Herrera. Post-doctoral researcher. Maria Zambrano
Programme.

Dr Jhonny Villarroel Rocha. Post-doctoral researcher. Maria Zambrano
Programme.

Helir Joseph Muñoz, PhD student (Public University of Navarra).

Soufiane El Mahmoudi, PhD Student

Aziza Imene Boulahbal, PhD Student

Sara Vinacua Conde, Researcher

ANOTHER RESEARCH LINES OF THE GROUP:

Development of organo-inorganic hybrid materials with environmental
applications as adsorbents and catalysts.

Development of new photocatalysts to obtain H₂O₂.

Advanced oxidation processes for urban wastewater treatment.

UV-visible photodegradation processes of emerging organic pollutants present
in wastewater.

Capture, storage, and recovery of CO₂ through methane reforming and
reduction.

Separation and purification processes of liquid streams.



Development of ceramic filters with antibacterial applications.

Synthesis of Nanoparticles based in Carbon for different purposes: cancer therapy, sensors, catalysis, plant treatment, etc.,.

▪ Entities involved in research lines and contact person:

Academic entities:

- Grupo Sol-Gel, Universidade de Franca (Brasil): Prof. Katia J. Ciuffi.
- Borekov Institute of Catalysis (Rusia): Dra. Maria N. Timofeeva.
- Grupo Materiales Funcionales y Catálisis, Universidad de Nariño (Colombia): Dr. Luis A. Galeano.
- Institute of Condensed Matter and Nanosciences. Université Catholique de Louvain (Bélgica): Prof. Eric Gaigneaux.
- University of Limerick (Irlanda). Dr Teresa Curtin.
- Universidad Nacional Pedro Ruiz Gallo (Peru). Dr. S. Huangal.
- University of Málaga. Prof. Juan Soto and M^a Soledad Pino
- University of Belgrade: Prof. M. Petkovic (VINCA) and Prof. K. Radotić (IRMS).
- ALBA Synchrotron Barcelona (Spain): Dr. T. Ducić
- College University of New York: Prof. Teresa J. Bandosz
- University of Porto: Prof. L. Pinto da Silva and J.E. Rodríguez-Borges

Industrial entities:

* IDALSA, S.L. Fernando Lou/Jonathan J. Torrez Herrera

* Micromeritics Instrument Corporation (EE.UU.). Dr S. Yunes

- Joint supervision of doctoral thesis with international universities or non-academic institutions:



1. Contribución al estudio de la modificación de las propiedades texturales de una saponita pilarizada con Al₁₃ como soporte de catalizadores de Pt y Pt-Ce. Mario Barrera Vargas (Colombia). 11/12/2006. Universidad Nacional de Colombia (Colombia). Co-dirección.
2. Peroxidación catalítica de contaminantes orgánicos en medio acuoso utilizando una bentonita modificada con Al y Fe, Cu o Mn. Luis Alejandro Galeano (Colombia). 21/12/2011. Universidad de Salamanca. Co-dirección.
3. Implementación de metodologías de producción más limpia en el área de Salcajá, Cuenca alta del río Samalá, en el occidente de Guatemala. Eddie Omar Flores Aceituno (Guatemala). 15/06/2012. Universidad Pública de Navarra. Co-dirección.
4. Eliminación y valorización de CO₂ presente en efluentes gaseosos mediante adsorción y reformado seco de metano. Siby Inés Garcés Polo (Colombia). 03/02/2016. Universidad Pública de Navarra. Co-dirección.
5. Separación electrostática de una emulsión de glicerina en biodiesel con aplicación de diferentes voltajes y distancias entre electrodos. Sebastián Huangal Scheineder (Peru). 17/01/2019. Universidad Nacional Pedro Ruíz Gallo (Perú). Co-dirección.
6. Elaboration de matériaux par imprégnation de charbon actif par le dioxyde de titane en utilisant la méthode sol-gel. Application à l'élimination des polluants organiques émergents et inorganiques en milieux aqueux. Nawal Taoufik (Marruecos). 13/12/2019. Université Hassan II de Casablanca. Co-dirección. Co-tutela.
7. Development of Ni/La-hexaaluminates from aluminum saline slags applied as catalysts in the dry reforming of methane. Jonathan Josué Torrez Herrera (Nicaragua). 2021. Universidad Pública de Navarra. Co-dirección.
8. Removal of emerging pollutants in water through adsorption and catalytic processes using pillared clays synthesized from aluminum saline slags. Yaneth Cardona Rodríguez (Colombia). 2022. Universidad Pública de Navarra. Co-dirección. Iberus-Talent.



9. Valorización química de CO₂ mediante hidrogenación para la obtención de metanol y productos derivados. Helir Joseph Muñoz Alvear (Colombia). Universidad Pública de Navarra. Co-dirección.

10. Etude des propriétés physicochimiques des matériaux composites: Elaboration, caractérisation pour des applications dans la dépollution par adsorption et de stockage d'énergie. Etude thermodynamique et texturale. Soufiane El Mahmoudi (Marruecos). Universidad Pública de Navarra/Universitè Hassan II de Mohammedia (Marruecos). Co-tutela académica. Co-dirección.

11. Synthèses et caractérisations des matériaux composites magnétiques/structure lamellaires encapsulés par des biopolymères. Investigation théorique et expérimentale. Imene Kecir (Argelia). Universidad Pública de Navarra-Université Ferhat Abbas Sétif 1 (Argelia). Co-dirección.

- Brief group overview

The research group of Environmental Technologies and Applications (TAMA) of the Public University of Navarra works on research lines dealing with porous and surface properties of solids; pillared clays; gas adsorption; energy storage; pollutants adsorption and removal by photodegradation; preparation, characterization and catalytic performance of metal supported nanocatalysts. Research is related to industrial waste management and valorization for environmental technologies and management.

Research interests of the group: Porous and surface properties of solids; Clays; Gas adsorption; Energy storage; Pollutants adsorption; Environmental technologies; Environmental management; Preparation, characterization and catalytic activity of metal supported nanocatalysts. Industrial waste management and valorization.

Preparation of nanoparticles based in carbon materials for cancer therapy, and catalysis namely carbon dots



ACADEMIC REQUIREMENTS:

Preferred academic degrees (not restrictive): Chemical Engineering, Chemistry, Biochemistry, Biotechnology, Materials Engineering.

