DEPARTAMENT DE QUÍMICA ANALÍTICA			
NÚMERO	**TEMA**	**TUTOR(S) ACADÈMIC(S) (si un és d'un altre departament, posa'l entre parèntesi)**	**TUTOR EXTERN (si escau)**
17	Isolation and characterization of extracellular vesicles (Evs)	Carmen Molins Legua i Lusine Hakobyan	
18	Extraction and physicochemical characterization of nanovesicles	Carmen Molins Legua i Lusine Hakobyan	
25	Use of Metal-Organic Frameworks (MOFs) and MOFs@Enzyme Composites for Sensing Applications	Héctor Martínez-Pérez Cejuela y José Manuel Herrero Martínez	
27	Development of Sensing Devices for the Determination of Total Lipid Content in Milk Samples	Héctor Martínez-Pérez Cejuela y Isabel Ten Doménech	
33	Development of 3D-printed polymer substrates for in situ generation of metal-organic frameworks as extraction systems of emerging pollutants	José Manuel Herrero Martínez y Ernesto Francisco Simó Alfonso	
35	Use of 3D Printing for the Selective Extraction of Proteins	Ernesto Francisco Simó Alfonso	
36	Development of a solid-phase extraction system using 4D Printing with stimuli-responsive materials	Enrique Javier Carrasco Correa y José Manuel Herrero Martínez	
47	Origami-inspired 3D-printed devices for the detection of proteins in food matrices	Enrique Javier Carrasco Correa y Ernesto Francisco Simó Alfonso	
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53	Asymptotic modeling of electroanalytical determinations in complex matrices	Antonio Doménech carbó	

VNIVERSITAT DE VALÈNCIA Facultat de Química

DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 Carmen Molins Legua

ACADEMIC TUTOR 2 Lusine Hakobyan

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): Química Analitica

TITLE (Mandatory in English)

Isolation and Characterization of Extracellular Vesicles (EVs)

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

The main objective of this study is the characterization of extracellular vesicles isolated from mesenchymal stem cells derived from dental pulp, focusing on the analysis of their size and the functional groups present on their surface using analytical techniques. Additionally, extracellular vesicles obtained from different dental pulp biopsies will be compared in order to assess potential variations between biological samples in terms of size and surface functional group composition.

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

Extracellular vesicles will be isolated from mesenchymal stem cells derived from dental pulp, obtained from different biopsies. The isolation process will involve tangential flow filtration (TFF) followed by size exclusion chromatography (SEC), ensuring high purity and structural integrity of the vesicles.

For size characterization, Dynamic Light Scattering (DLS) will be used to determine the average hydrodynamic diameter and size distribution in suspension. In addition, the zeta potential will be measured as an indicator of surface charge and stability.

To characterize the functional groups present on the vesicle surface, Fourier-transform infrared spectroscopy (FTIR) and Raman spectroscopy will be employed. These techniques enable the identification of molecular vibrations associated with specific chemical bonds, providing insights into the vesicles' surface composition.

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DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 Carmen Molins Legua

ACADEMIC TUTOR 2 Lusine Hakobyan

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): Química Analitica

TITLE (Mandatory in English)

Extraction and Physicochemical Characterization of Nanovesicles

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

The main objective of this study is to characterize nanovesicles obtained by extrusion from mesenchymal stem cells derived from dental pulp, analyzing parameters such as size, zeta potential, and surface functional groups using specific analytical techniques. The study aims to assess how the production method influences the physicochemical properties of the vesicles.

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

Nanovesicles will be generated by sequential extrusion through polycarbonate membranes with defined pore sizes, using mesenchymal stem cells derived from dental pulp as the biological source. This method enables the production of vesicles with uniform size in a reproducible manner.
One of the main advantages of extrusion is that it is a fast, straightforward, and scalable technique, making it a promising option for large-scale vesicle production in clinical or industrial applications.

The physicochemical characterization of the nanovesicles will include:
Dynamic Light Scattering (DLS) to determine hydrodynamic size and size distribution;
Zeta potential measurement to assess colloidal stability;
FTIR and Raman spectroscopy to identify surface functional groups.

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DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 Héctor Martínez Pérez Cejuela

ACADEMIC TUTOR 2 José Manuel Herrero Martínez

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): ANALYTICAL CHEMISTRY

TITLE (Mandatory in English)

Use of Metal-Organic Frameworks (MOFs) and MOFs@Enzyme Composites for Sensing Applications

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

-To develop innovative sensing strategies based on metal-organic frameworks (MOFs).
-To assess and compare the catalytic (enzyme-mimicking) activity of MOFs and MOF@enzyme hybrids with that of native enzymes.
-To evaluate the retained catalytic performance towards harassing conditions.
-To validate the proposed sensing methodologies and its application to real samples
-Writing reports.

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

Review the literature on MOFs as enzyme alternatives in sensing.
Select the most suitable MOF for the chosen enzymatic system.
Optimize experimental conditions for detection and study MOF function.
Validate the method (linearity, precision, accuracy, LOD, LOQ).
Analyze real or model samples.
Write and submit the TFG report.

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DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 Héctor Martínez Pérez Cejuela

ACADEMIC TUTOR 2 Isabel Ten Doménech

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): ANALYTICAL CHEMISTRY

TITLE (Mandatory in English)

Development of Sensing Devices for the Determination of Total Lipid Content in Milk Samples

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

-To develop a simple sensing method for total lipid detection in milk.
-To select and optimize the appropriate sensing material or platform.
-To validate the method in terms of accuracy and sensitivity.
-To apply the method to real milk samples.

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

-Review existing sensing approaches for lipid analysis.
-Prepare and calibrate the sensing device using lipid standards.
-Optimize key experimental parameters (e.g., sample volume, reaction time).
-Evaluate performance using real milk samples and compare with a reference method.

Annex 1 (**not to be printed**)

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DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 José Manuel Herrero Martínez

ACADEMIC TUTOR 2 Ernesto Francisco Simó Alfonso

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): Analytical Chemistry

TITLE (Mandatory in English)

Development of 3D-printed polymer substrates for in situ generation of metal-organic frameworks as extraction systems of emerging pollutants

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

- To design and fabricate 3D-printed polymer substrates suitable for posterior in situ synthesis of Metal-Organic Frameworks (MOFs) from polymerization mixtures.
- To develop and optimize protocols for the in situ generation of MOFs directly on the 3D-printed substrates.
- To characterize the structural and chemical properties of the resulting MOF-functionalized materials.
- To evaluate the performance of the composite materials in extraction of pollutants

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

Functionalizable resins for 3D printing will be developed.
Once the piece is printed, it will be derivatized with MOFs.
Two strategies will be proposed for MOF anchoring. First, MOFs will be attached directly onto the surface of the printed pieces.As a second strategy, layer-by-layer growth of the MOF on the surface of the piece will be explored.
The modified pieces will be used for the extraction of emerging contaminants.

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DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 Ernesto Francisco Simó Alfonso

ACADEMIC TUTOR 2

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): Química analítca

TITLE (Mandatory in English)

Use of 3D Printing for the Selective Extraction of Proteins

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

Development of new compatible resins for 3D printing

Application of selective extraction systems

Evaluation of optimal extraction conditions

Application to real samples

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

Different mixtures of potential monomers will be studied, as well as the addition of various modifiers.

Selective systems such as aptamers will be used for the retention of target proteins.

The anchoring of these systems onto the designed 3D-printed pieces will be evaluated.

The various parameters associated with the extraction process will be optimized.

The developed method will be applied to the extraction of proteins from real samples.

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DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 Enrique Javier Carrasco Correa

ACADEMIC TUTOR 2 José Manuel Herrero Martínez

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): Analytical Chemistry

TITLE (Mandatory in English)

Development of a solid-phase extraction system using 4D Printing with stimuli-responsive materials

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

- To design and print functional prototype of a solid-phase extraction device using stimuli-responsive polymers suitable for 3D printing.
- To optimize the printing parameters for manufacturing reproducible and chemically stable devices.
- To evaluate the performance of the 3D-printed solid-phase extraction system in terms of extraction efficiency, selectivity, and reusability.

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

The project will begin with the design of a solid-phase extraction (SPE) device using CAD software. Selected stimuli-responsive polymers compatible with FDM 3D printing will be characterized and processed to fabricate the SPE components. Printed devices will be tested for responsiveness to external stimuli (e.g., pH, temperature). Finally, the extraction efficiency and selectivity of the system will be characterized using model analytes and the analytical figures of merits will be evaluated.

Annex 1 (**not to be printed**)

VNIVERSITAT DE VALÈNCIA Facultat de Química

DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 Enrique Javier Carrasco Correa

ACADEMIC TUTOR 2 Ernesto Francisco Simó Alfonso

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): Analytical Chemistry

TITLE (Mandatory in English)

Origami-inspired 3D-printed devices for the detection of proteins in food matrices

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

- Design and fabrication of origami-inspired 3D-printed devices intended for protein sensing in complex food matrices.
- Morphological and structural characterization of the fabricated devices.
- Evaluation of the protein detection performance in model and real food samples.
- Application of the developed devices to the detection of proteins in commercial food products.

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

- Design and 3D-printing of foldable (origami-like) polymeric structures using suitable printing technologies (FDM).
- Morphological and structural characterization using scanning electron microscopy (SEM) and other techniques (e.g., FTIR, XRD if relevant).
- Evaluation of protein sensing under controlled conditions using model protein solutions - Analytical validation of the detection method in terms of selectivity, sensitivity, and reproducibility.
- Application of the optimized method to real food samples after appropriate sample preparation.

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DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 Antonio Doménech carbó

ACADEMIC TUTOR 2

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): Analytical Chemistry

TITLE (Mandatory in English)

Logistic descripion of electron transfer processes under diffusion control

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

The proposal of a theoretical model, based on logistic growth formalisms, aimed to describe electron-transfer processes occurring under diffusive control. These are the basic processes in analytical electrochemistry and the idea is to achieve a formulation that simplifies the existing approaches requiring numerical integrations.

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

Theoretical analysis and comparrison of the predicions from different models

Annex 1 (**not to be printed**)

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DEGREE FINAL PROJECT
CHEMISTRY DEGREE

ACADEMIC TUTOR 1 Antonio Doménech carbó

ACADEMIC TUTOR 2

EXTERNAL TUTOR (if needed):

DEPARTMENT(S): Analytical Chemistry

TITLE (Mandatory in English)

Asymptotic modeling of electroanalytical determinations in complex matrices

OBJECTVES / OBJECTIUS / OBJETIVOS: (Choose the language)

The proposal of a theoretical model aimed to model the current/concentration calibration graphs appearing in the determination of an electroactive analyte in the presence of a complex matrix where cross-rection can occur.

METHODOLOGY / METODOLOGIA / METODOLOGÍA: (Choose the language)

Theoretical analysis and comparrison of the predicions from different models and available experimental data for the determination of neutrotransmitters in biological fluids