

Chemical Excellence at the Service of the Society

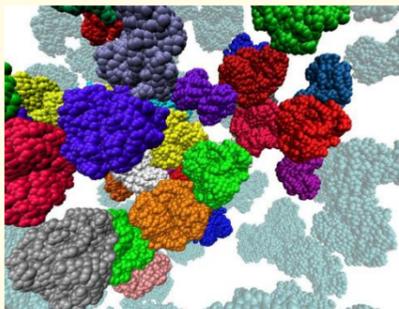


The **Institute of Advanced Chemistry of Catalonia (IQAC-CSIC)** is one of the research centers that the *Consejo Superior de Investigaciones Científicas* has in Catalonia. Our Institute was created in 2008 to better accommodate the interests of CSIC scientists that were working in selected Chemistry areas in Barcelona.

Research Lines

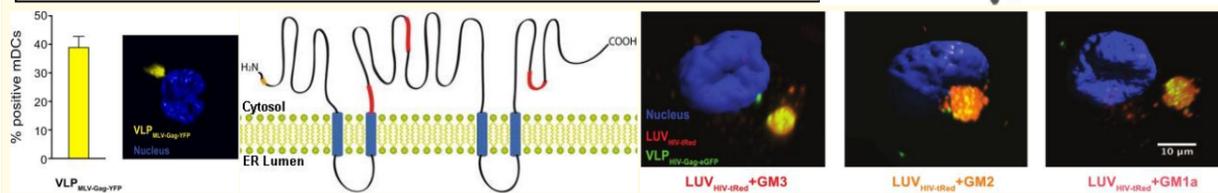
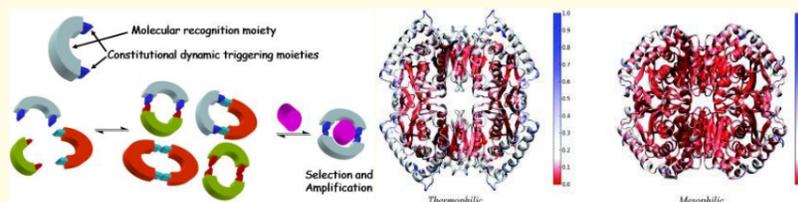
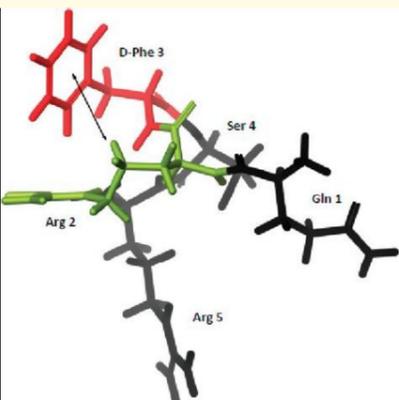
Research groups, which are composed by 50 staff members and more than 100 hired technical personnel, graduate students and postdocs, have focused their research lines in the following areas:

- Theoretical and Computational Chemistry
- Biophysics and Self-Assembling Systems
- Biological Chemistry
- Chemical and Biomolecular Nanotechnology
- Sustainable Chemistry



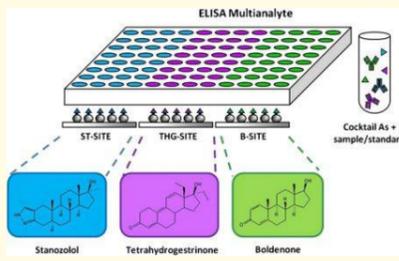
BIOMEDICINAL CHEMISTRY: Multidisciplinary research focused on the biomedical applications of peptides, lipids and glycoconjugates is conducted. The early detection, discovery of markers and treatment of serious human diseases, such as amyloidosis related to the protein transthyretin, chronic pain, sphingolipidosis, cancer, neurodegeneration, autoimmune and infectious diseases, are emphasized. The research encompasses the rational design of active molecules (peptides, glycoconjugates and small molecular entities) based on the knowledge of specific cell signalling routes, metabolic pathways, mechanisms of ligand-protein and protein-protein interactions, etc., as well as the concept of chemical modulation for optimising hit compounds based upon the modern Medicinal Chemistry technologies (Combinatorial Chemistry, in silico design and screening, solid phase organic synthesis, delivery systems).

BIOLOGICAL CHEMISTRY: Active work is being carried out in the isolation, design, synthesis, biosynthesis, and activity evaluation of bioactive compounds (insect pheromones and pest control, secondary metabolites, biocatalysts, agroforestry subproducts and mechanisms of action of antioxidant protectors). We do have also experts in the Molecular Recognition of ions and molecules of biological interest and in the study of non-covalent interactions, as well as in the modification of the activity and selectivity of biocatalysts by means of genetic engineering. In the **Theoretical and Computational Chemistry**, topics such as the modelling of enzymatic catalysis mechanisms, the study of the electronic structure and reactivity of molecules and the elucidation of reaction mechanisms of interest in atmospheric chemistry, are also explored.

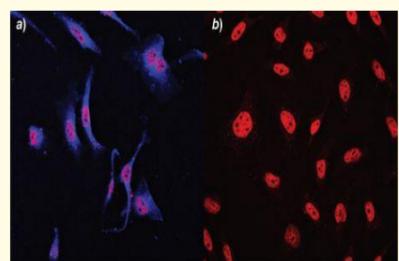


Chemical and Biomolecular Nanotechnology: Intense research on bioactive organic molecules and biomolecules, nanomaterials and devices and self-organized supramolecular or colloidal systems is conducted. Thus, knowledge on the chemistry of oligonucleotides makes it possible to rationally synthesize molecules with affinity to dsDNA and to investigate the formation of G-Rich oligonucleotides, G-quadruplex or the gene expression controlled by iRNA. The ability to produce antibodies -natural molecules with inherent capabilities to specifically react with their counter antigen- and to direct their features according to the needs, permits the design of bioreceptors for a wide range of applications. The integration of these biomolecules with certain micro(nano)materials and devices with unique physical properties allows for the development of novel biosensors with improved features envisaging a new generation of molecular diagnostic tools useful in the clinical and food safety fields. Finally, and regarding the preparation of new nanostructures, the expertise acquired for many years on the chemistry of surfactants and their capability to self-aggregate to form complex supramolecular structures (micelles, liquid crystals, microemulsions, nano-emulsions, highly concentrated emulsions, etc.) has lead to investigate their use as templates for the preparation of new nanostructured materials (organic, inorganic, hybrid) with controlled size and morphology as well as new drug delivery systems. In this Nanotechnology area, research in the adsorption and self-aggregation of surfactants as well as in the physical chemistry and biophysics of natural lipids at interfaces and membranes is also performed.

SUSTAINABLE CHEMISTRY: The research deals with theoretical and applied aspects of product and chemical processes technology with special emphasis in the synthesis, the physical chemistry and the biology of surfactants. This research focuses its interest on environmental and human health improvement. Among the specific research lines, we can highlight the research and development of biocompatible surfactants and ionic liquids, the distribution and effect of surfactants and ionic liquids in the environment, the development of non-contaminant industrial processes, as well as the minimisation, recycling and valorisation of by-products and waste of chemical industries.



<p>IC₅₀ = 125 μM MRSA IC₅₀ = 0.5-2 mM Gram positive bacteria IC₅₀ ≥ 2 mM Gram negative bacteria IC₅₀ ≥ 2 mM fungi (yeasts) IC₅₀ > 2 mM fungi (filamentous)</p>	<p>IC₅₀ > 2mM MRSA IC₅₀ > 2 mM Gram positive bacteria IC₅₀ ≥ 2 mM Gram negative bacteria IC₅₀ ≥ 2 mM fungi (yeasts) IC₅₀ > 2 mM fungi (filamentous)</p>		



Knowledge Transfer

Several patents presented in recent years have been licensed to companies from different European countries.

Contract research · Valorization · Out-Licensing of IP rights · Bring our scientific know-how and technologies to the society

Technologies Available

Life Sciences

- Cancer
- Inflammatory diseases
- Rare diseases
- Immunology / adjuvants
- Pain
- Medical diagnosis
- Drug delivery
- Pharmacological tools

Chemical Technology

- Biosensors
- Food safety tests
- Dyes
- Skin care

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The IQAC is compromised in a wide variety of national and international scientific projects (more than 9.5 M€ between 2008-2011). More than 500 papers in international journals and several patent applications in that period.

Technical and Scientific Services:

- Organic Microanalysis
- Thermal Analysis and Calorimetry
- Spectroscopy (IR, UV)
- Magnetic resonance
- SAXS-WAXS
- Skin absorption and Skin Efficacy
- Characterisation of colloidal dispersions
- Custom Antibody (CAbs)
- Biodegradation and Aquatic Toxicity
- Synthesis of High Added Value Molecules
- Proteomics Service

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