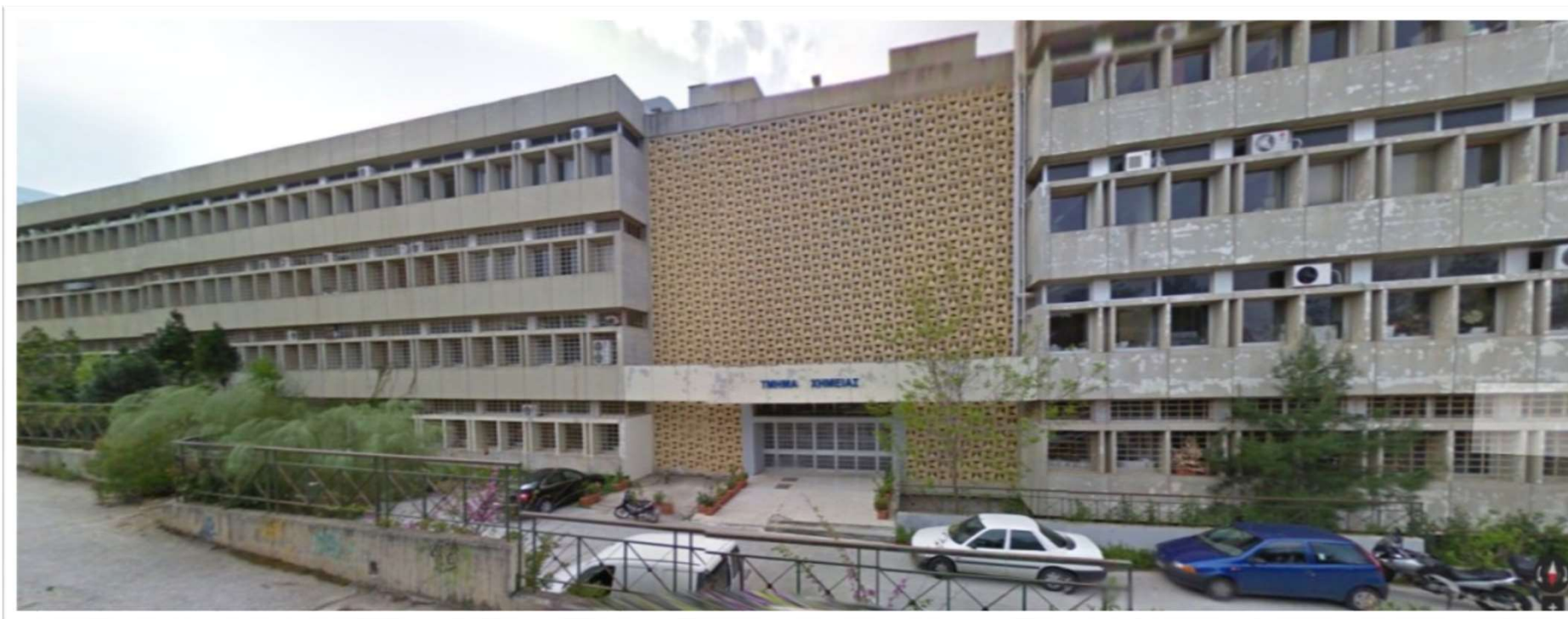


Department of Chemistry @ NKUA



**Partial view of Chemistry facilities
on the main university campus east of
downtown Athens**

Chemistry @ NKUA in numbers

- 150 undergraduate students × 4 years (no tuition)
 - 236 graduate students trained for 1.5-2 years (mostly with tuition)
 - 168 PhD candidates (some on scholarships)
 - 11 postdocs
-
- 44 active faculty members (assistant, associate, full professors)
 - 34% with PhDs from USA, UK, France, Germany, Belgium
 - Almost all with international postdoctoral experience

The Chemistry Department has 8 Laboratories

INORGANIC CHEMISTRY

**PHYSICAL
CHEMISTRY**

ORGANIC CHEMISTRY

INDUSTRIAL CHEMISTRY

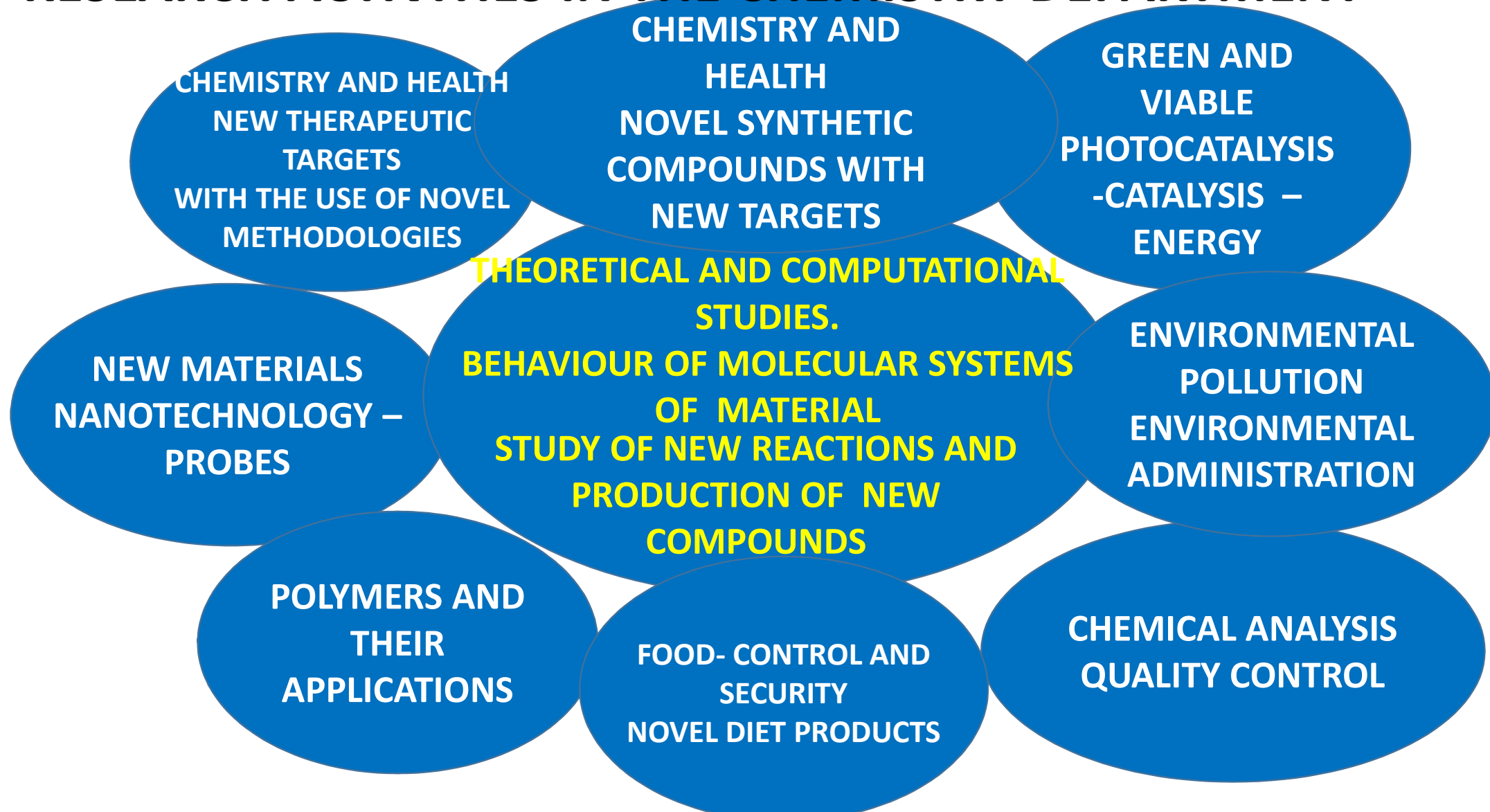
FOOD CHEMISTRY

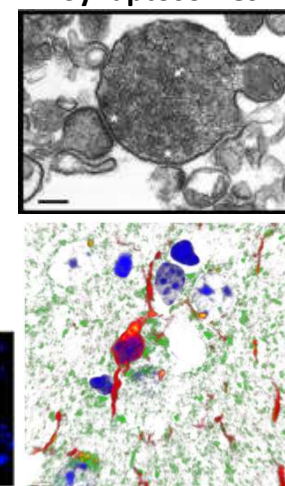
**ANALYTICAL
CHEMISTRY**

BIOCHEMISTRY

**ENVIRONMENTAL
CHEMISTRY**

RESEARCH ACTIVITIES IN THE CHEMISTRY DEPARTMENT







National and Kapodistrian
University of Athens

— EST. 1837 —



Food Chemistry Laboratory

Faculty Members

[Proestos Charalampos](#) (Associate Professor, **Director**)

[Valdramidis Vasiilis](#) (Associate Professor)

[Dasenaki Marilena](#) (Assistant Professor)

Official Site: <https://foodscience-en.chem.uoa.gr/el/>

RESEARCH FIELDS

1. Food Chemistry and Analysis
2. Foodomics
3. Food contaminants determination
4. Food microbiology (Euro Food safety 2 lab) and technology
5. RnD for functional foods
6. New product development

(<https://alchemy.eadppa.gr/en/white-wine/>)

Current international Food Chemistry projects



Shielding food safety and security by enabling the foresight of fungal spoilage and mycotoxins threats in the Mediterranean region under climate change conditions **HORIZON-WIDERA-2021-ACCESS-03-01**



SUstainable nanoPaRticles Enabled antiMicrobial surfaceE coatings
HORIZON-CL4-2021-RESILIENCE-01



Nanoencapsulation of bioactive compounds from plant by products to produce sensitive skin cosmetics

MARIE SKŁODOWSKA-CURIE ACTIONS, Staff Exchanges (SE) Call:
HORIZON-MSCA-SE-2021



Excellence hub in green technologies: Introducing innovation ecosystems in the Mediterranean food value chain

HORIZON-WIDERA-2022-ACCESS-04



The European Food Risk Assessment (**EU-FORA**) Fellowship Programme (2022-2023)

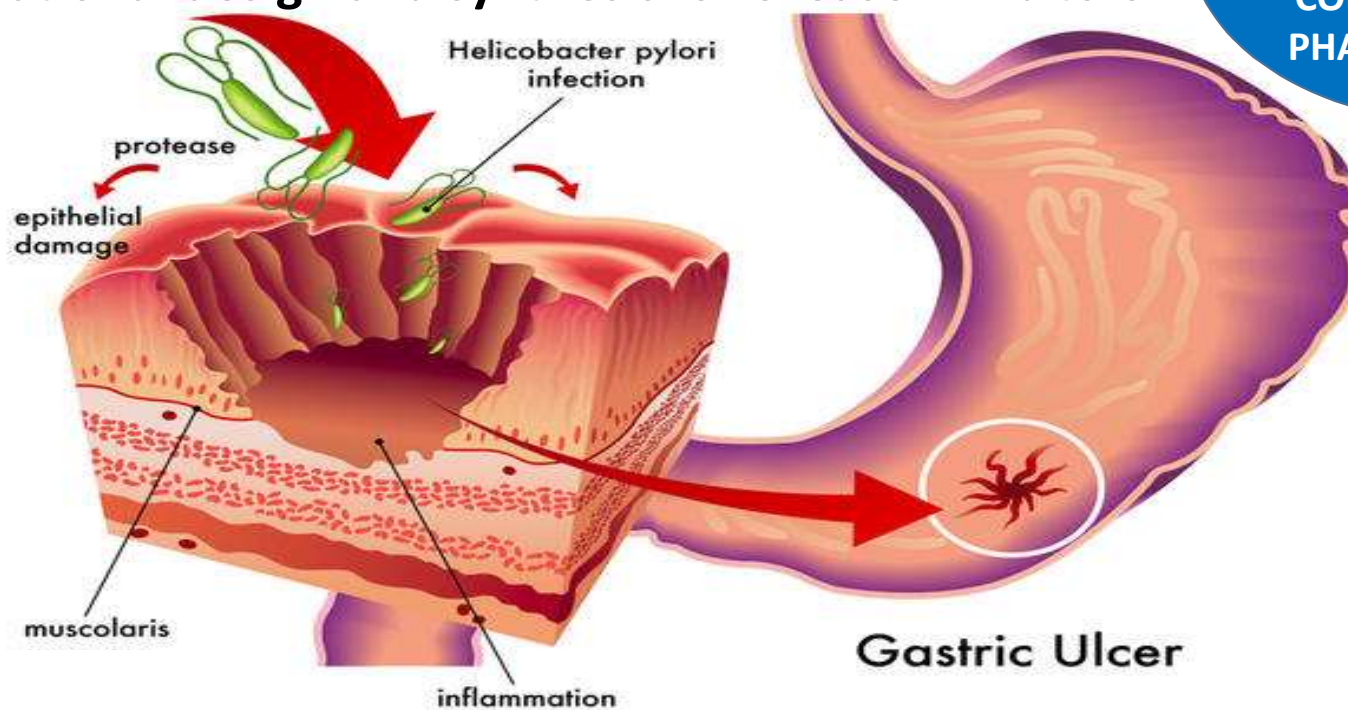
Food Chemistry projects funded by domestic sources

- *“Development and Installation of Innovative Technologies in rice cultivation to improve the competitiveness of Agricultural Farms”* – **ΥΔΡΟΤΟΜΩ**
- *“Methodology development for the quality control-adulteration of olive products, using modern analytical and chemometric techniques”* – **HOLEA**
- *“Encapsulation of bioactive compounds from aromatic and medicinal plants in nanoparticles for use in the production of: a) Biofunctional foods & Nutritional Supplements, b) Livestock protection products, c) Plant protection products”* – **ENBIOS**
- *“Capturing the atomic and metabolomic profile of Greek wine products and spirits of Northern Greece, Sections 3 and 6”* – **BACHUS**
- *“Chemical Analyses of wine products and spirits from Greek regions known for the production of wine spirits (tsipouro) and products (vinegar)”* – **BACHUS**
- *“Development and production of innovative bio-functional pastry products with high nutritional value, based on the traditional sourdough, and enriched with plant antioxidants from agro-food by-products of the Attica Region”* – **FUNBAKES**
- *“Prominence of the plant biodiversity of the Attica Region, through the utilization of its beekeeping plants, for the production of innovative and culinary honey products, with the use of modern encapsulation technologies”*
- *Provision of services and analysis of raw materials and finished soft drink product from Sea Buckthorn leaves.*
- *Provision of services and analyses of infusion, value-added water with sea buckthorn leaves.*

Laboratory of Organic Chemistry

Rational design and synthesis of Urease inhibitors

CHEMISTRY AND
HEALTH
DISCOVERY OF
NOVEL
COMPOUNDS WITH
PHARMACOLOGICAL
ACTION

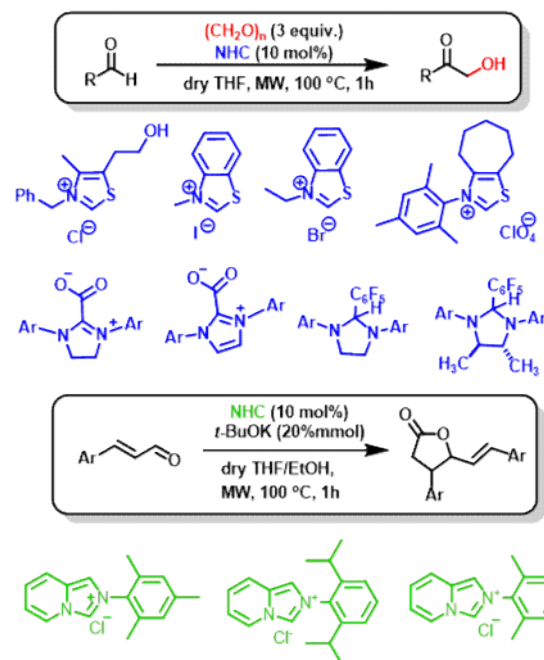


National
and Kapodistrian
University of Athens



Wrocław University
of Science and Technology

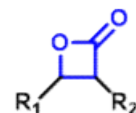
N-Heterocyclic carbenes as organocatalysts



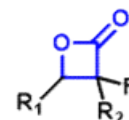
Tetrahedron **2016**, 72, 7628; *Tetrahedron* **2017**, 73, 7295;
Tetrahedron Lett. **2020**, 61, 151419.

Novel compounds against tuberculosis

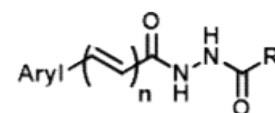
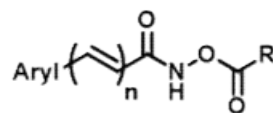
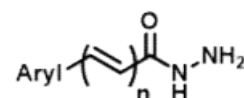
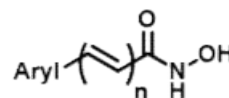
β -Lactones



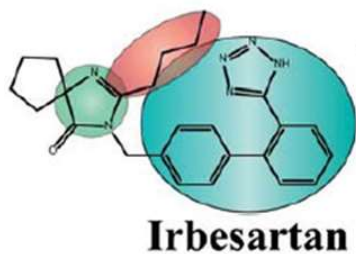
R_1, R_2 : H, Alkyl, Alkenyl or Alkynyl chain
 Mixture of 4 diastereomers or racemic *cis/trans* mixture or pure enantiomers



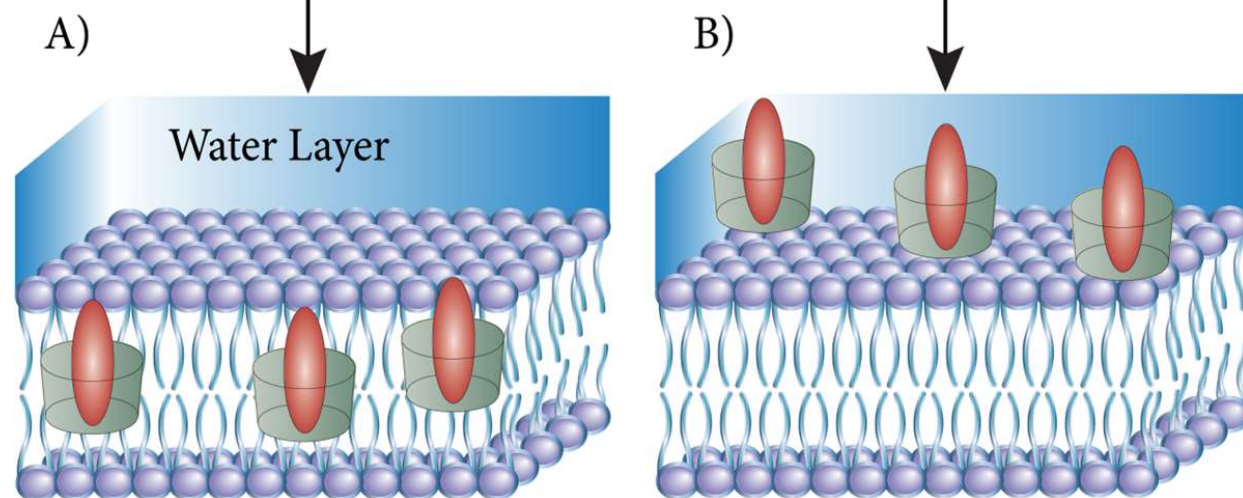
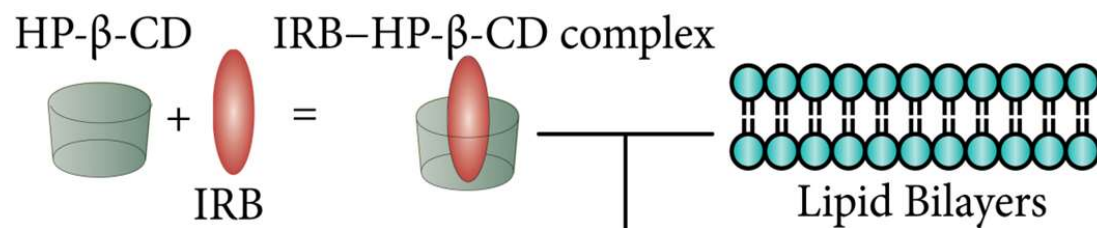
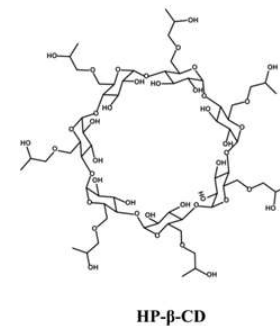
Fluoro-substituted β -lactones



ChemMedChem **2019**, 14, 349; *Bioorg. Med. Chem. Lett.* **2022**, 64, 128692



TARGETING DRUGS



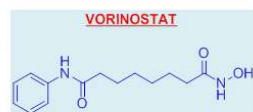


Solar Light

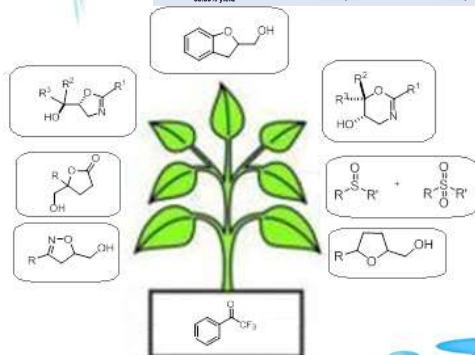


Photochemistry – Upcycling of Plastic waste

Assoc. Prof. Christoforos Kokotos



- ✓ *Trends Chem.*, **2023**, 5, 116
- ✓ *ChemSusChem*, **2023**, 16, e202201998
- ✓ *Green Chem.*, **2022**, 24, 6224
- ✓ *Green Chem.*, **2022**, 24, 4108
- ✓ *ChemSusChem*, **2022**, 15, e202102441
- ✓ *Green Chem.*, **2021**, 23, 546
- ✓ *ChemSusChem*, **2020**, 13, 5934
- ✓ *Angew. Chem. Int. Ed.*, **2020**, 59, 1735
- ✓ *Green Chem.*, **2020**, 22, 3539
- ✓ *Green Chem.*, **2020**, 22, 471
- ✓ *Green Chem.*, **2019**, 21, 669



Organocatalytic Oxidations – Medicinal Chemistry – Green Solvents

- ✓ *Green Chem.*, **2022**, 24, 6435
- ✓ *Chem. Sci.*, **2021**, 12, 10191
- ✓ *J. Med. Chem.*, **2021**, 64, 5654
- ✓ *Adv. Synth. Catal.*, **2019**, 361, 1792
- ✓ *Green Chem.*, **2017**, 1291
- ✓ *Adv. Synth. Catal.*, **2017**, 359, 1577
- ✓ *Org. Lett.*, **2017**, 19, 106
- ✓ *Green Chem.*, **2017**, 19, 670
- ✓ *Chem. Eur. J.*, **2015**, 21, 5238
- ✓ *J. Org. Chem.*, **2014**, 79, 4270
- ✓ *Chem. Eur. J.*, **2014**, 20, 559
- ✓ *ACS Catalysis*, **2013**, 3, 2239



2014 Academic Young Investigators

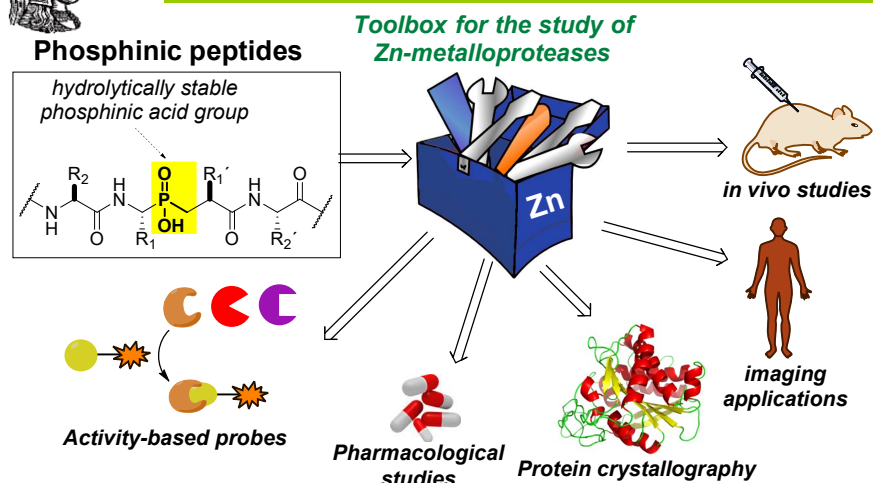


organocatalysis cost action





DIMITRIS GEORGIADIS' RESEARCH GROUP



➤ Design and synthesis of potent and selective **inhibitors of Zn-metalloproteases** involved in severe pathologies (**hypertension, tumor metastasis, arthritis, autoimmune diseases**, etc).

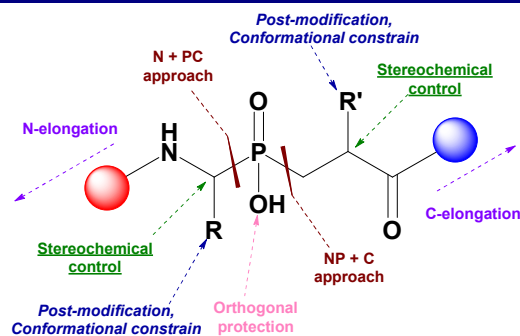
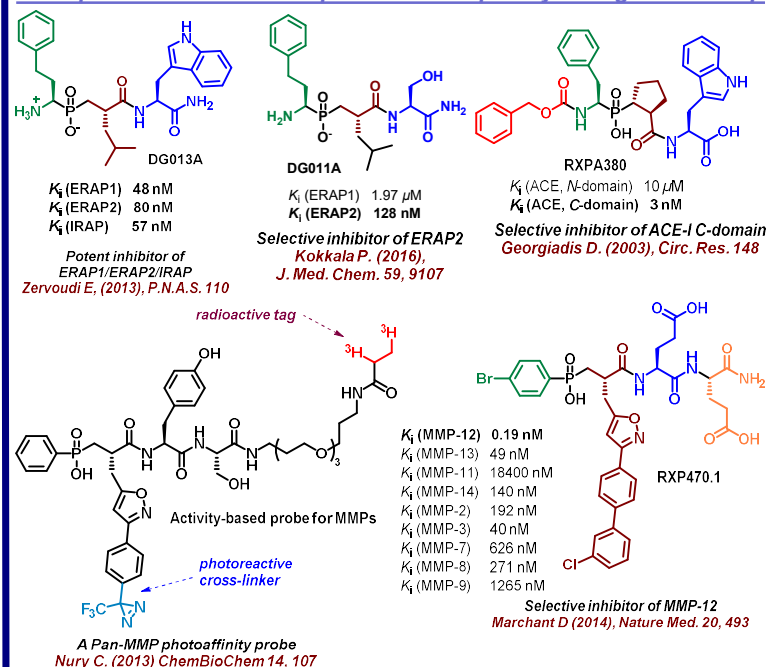
➤ Development of **molecular tools** based on Zn-metalloprotease inhibitors for applications in **various fields of biochemistry/biology/medicine**

➤ Development of **synthetic methodologies** towards **organophosphorus bioactive compounds**.

➤ Main synthetic targets: (a) **Late stage diversification** or functionalization, (b) Introduction of **conformational constraints**, (c) Novel **P-C bond-forming reactions**, (d) Optimization of synthetic methodologies in terms of **stereoselectivity** and **efficiency**. (e) **Combinatorial chemistry**

Georgiadis D. (2022), *ACS Pharmacol Transl Sci* 5, 1228
Georgiadis D. (2020), *Front. Pharmacol.* 11, 585838

Examples of inhibitors and probes developed by Georgiadis' Group



Kokkala, P. (2022) *Molecules* 27, 1242
Kaminska, M. (2021) *Angew Chem* 133, 18420
Kokkala, P. (2021) *Org. Lett.* 23, 1726
Covaleda, G (2019) *J. Med. Chem.* 62, 1917
Voreakos, K. (2019) *Org. Lett.* 21, 4397
Bordenave, T. (2016) *Bioconjugate Chem.* 27, 2407
Kalyva, M. (2015) *Chem. Eur. J.* 21, 3278
Georgiadis, D. (2015) *Top. Curr. Chem.* 1-38
Rogakos, V (2009) *Org. Lett.* 11, 4696
Nasopoulou, M. (2007) *J. Org. Chem.* 72, 7222

Jullien N. (2010) *J. Med. Chem.* 53, 208-220
Georgiadis D. (2008) *Bioorg. Med. Chem.* 8781



PROTECT project ► Improve the properties and durability of **Kevlar** (anti-ballistic), **Nomex** (heat-resistant/insulating), and **cellulose fibbers and materials** (UV-resistance, anti-bacterial, flame retardant, water-repellent) **via surface modifications**.

► PROTECT was ranked **2nd out of 206 projects/consortia** in the field of “Materials-Constructions” that competed in the specific call (Research-Create-Innovate) **amongst all Greek Universities, Research Institutions, SMEs, and Industries**.

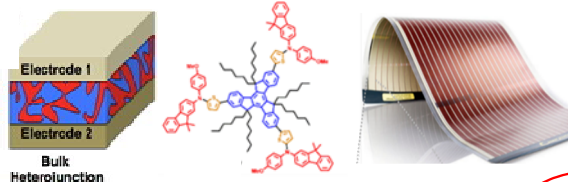
Consortium ► Vougioukalakis' group, **University of Athens** (Chemical Synthesis)
Tagmatarchis' group, **National Hellenic Research Foundation** (Materials Development)
Costas Siamidis S.A. (Materials Evaluation – Bulletproof Vest Prototypes Development)
Greek Ministry of Defense – 700 Greek Army Factory (Materials Evaluation)



Total Project Funding: 871,002.32 €.

Other Selected Projects:

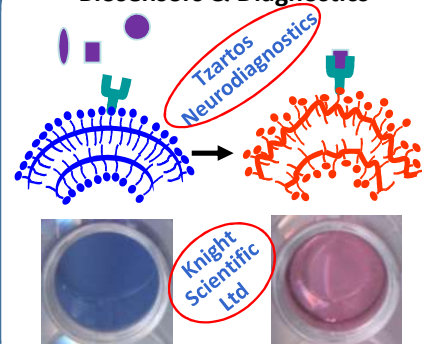
Materials for Organic Electronics



J. Am. Soc. **2004**, 126, 15956
J. Phys. Chem. C **2014**, 118, 2361
ChemistrySelect **2016**, 6, 1232
Eur. Pol. J. **2016**, 83, 148
Nature Commun. **2021**, 12, 4868

NCSR Demokritos
NHRF - ITPC
Advent Technologies S.A.

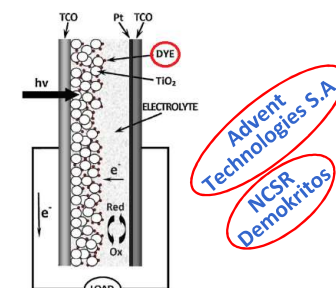
Materials for Chemosensors, Biosensors & Diagnostics



ChemPlusChem **2016**, 81, 913
Sensors **2020**, 20, 5172

Tzartos Neurodiagnostics
Knight Scientific Ltd

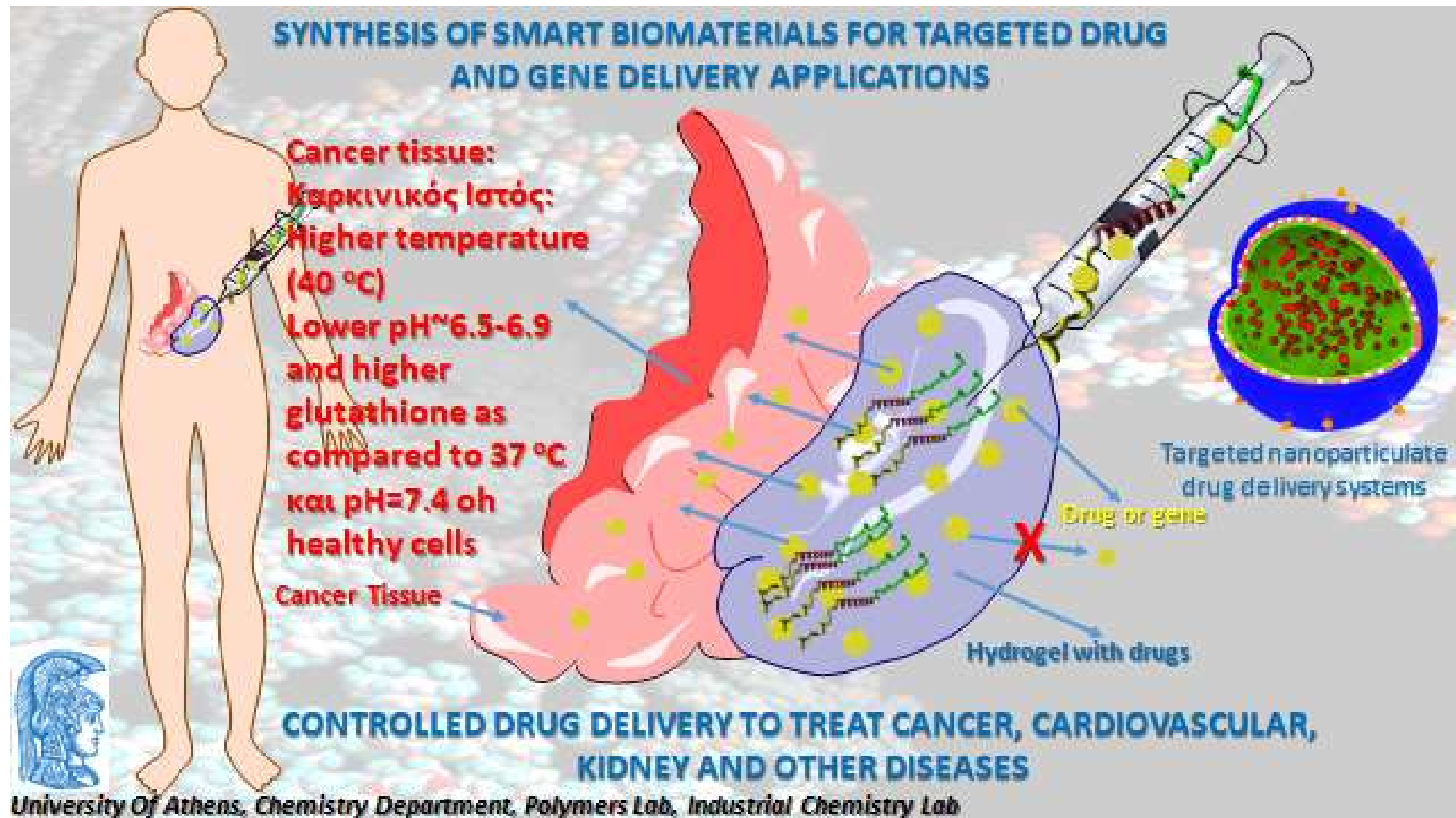
Materials for Dye-Sensitized & Perovskite Solar Cells



J. Phys. Chem. C **2014**, 118, 16760
ChemSusChem **2015**, 8, 588
Synlett **2017**, 28, 929
Dyes Pigments **2019**, 165, 308
J. Mater. Chem. C **2022**, 10, 12751

Advent Technologies S.A.
NCSR Demokritos

LABORATORY OF POLYMERS

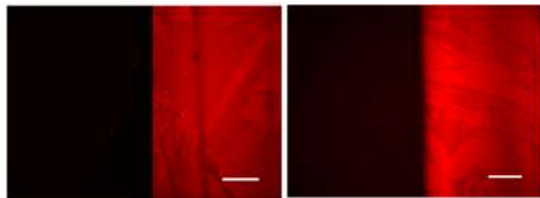


Margarita Chatzichristidi's Group

Research & Scientific Interests

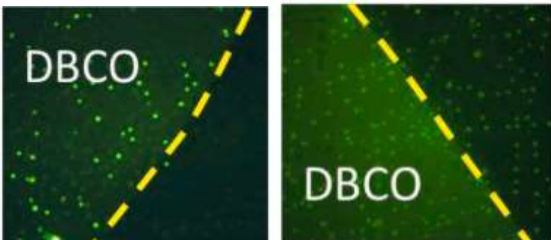
- **Micromachining**
- **Fabrication of novel devices using non- conventional lithography**
- **Fabrication of microsystems using conventional lithographic patterning methods**
- **Design and characterization of materials suitable for organic electronics**
- **Lithographic evaluation of new materials**
- **Surface modification for bio-applications**
- **Lithographic materials for specific attachment of biomolecules and cells**
- **Polymer nanocomposite with metal oxides**
- **Chemical methods for 3D nano-architectures of metal oxides**

Surface modification for bio-applications



Fluorescence microscope from silicon wafers coated with (a) PFMA homopolymer and PFMA:VBGE 1:1 copolymer after incubation with biotinylated BSA and reaction with AlexaFluor546 labelled streptavidin (the left is the unexposed area of the film and on the right is the exposed)

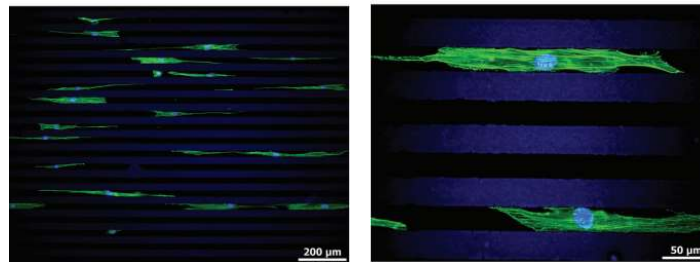
A. Nika et al. , Polymers 15 (2023) , 493.



Fluorescence images obtained from surfaces reacted with 5-FAM-azide after modification with: EPRmed/ rabbit IgG reacted with sulfo-NHS-DBCO for 2 h, and 24 h

Vrettou et al. Surfaces and Interfaces 36 (2023) 102500

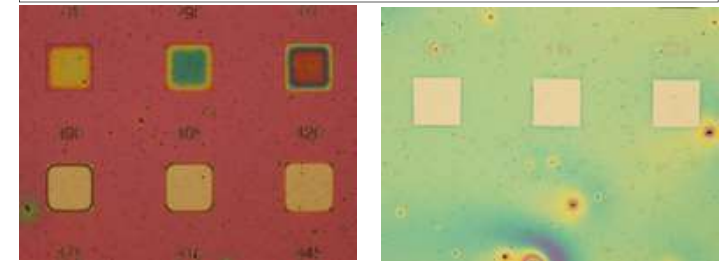
Lithographic materials for specific attachment of biomolecules and cells



Fluorescence microscopy images of smooth muscle cells adherent after 1-day culture on photopatterned: PEG-b-PTHPMA43-57 diblock copolymer films with a stripe pattern of 25-μm.

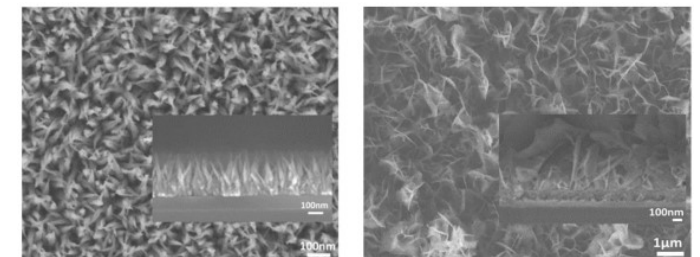
D. Kourti et al. Macromol. Biosci. 23 (2023) , 2200301

Metal oxides and Polymer nanocomposites with MO



Contrast curve patterns of CuO/PMMA nano-composites as e-beam resist materials.

G. Geka et al., Nanomaterials 11(3) (2021), 76



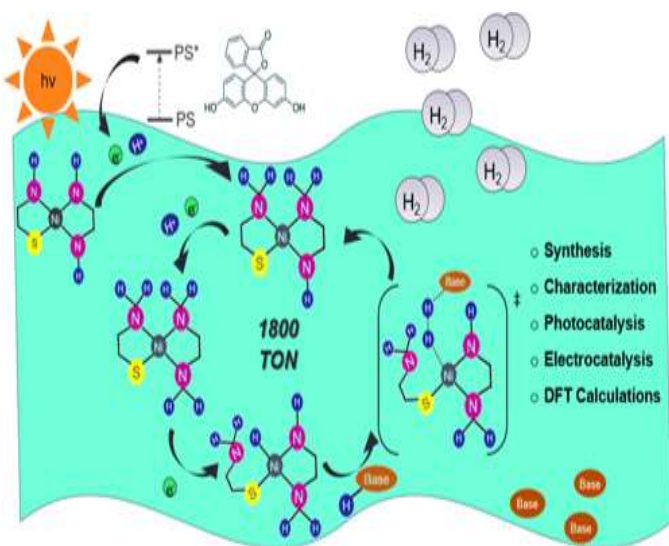
SEM images of the hydrothermally-grown (a) flame-like CuO nanostructures and nanosheets/nanopetal-like NiO
V. Constantoudis et al., Micro and Nano Engineering 16 (2022) 100148

Inorganic Chemistry Laboratory

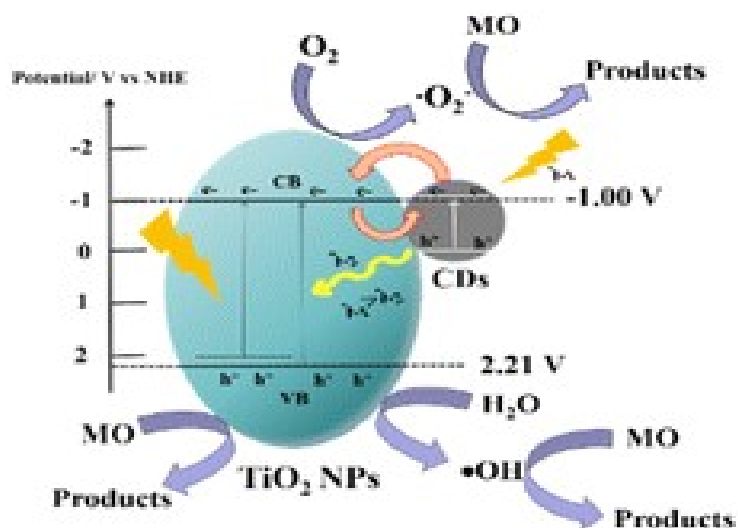
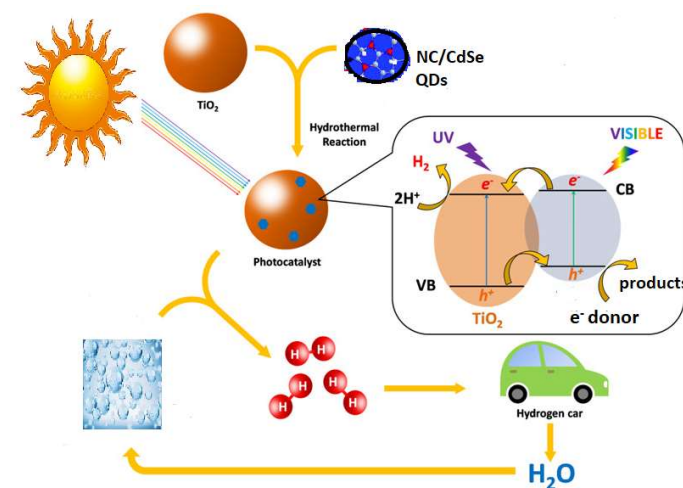
The research of its members extends from basic chemistry to applications in Catalysis, Energy, Biological, and Environmental Chemistry.

Computational Chemistry is also under staff's interest for elucidating the mechanisms of the reactions and the active sites of catalysts.

Synthesis and characterization of molecules and nanomaterials are the focus of Inorganic Lab's research.

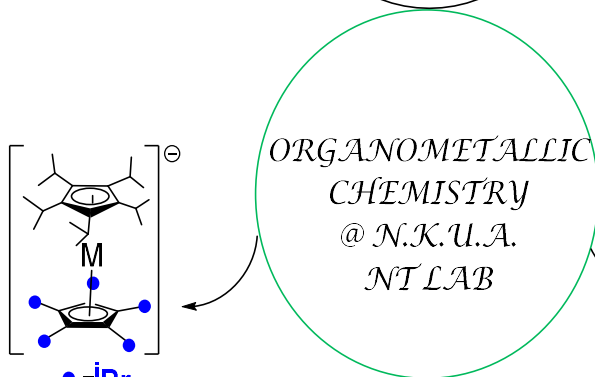
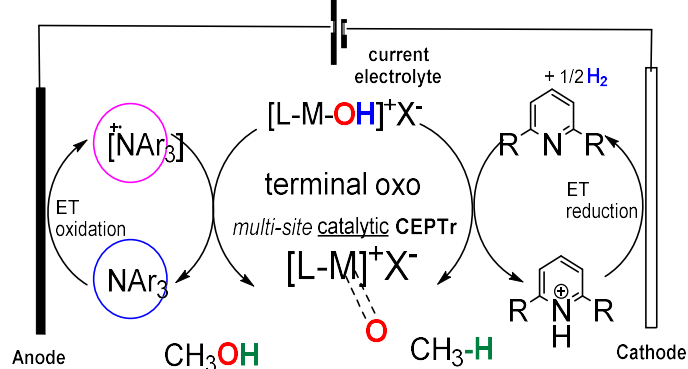


- Biomimetic evolution of hydrogen** from water by electrocatalysis and photocatalysis.
- Design of catalysts with non-innocent ligands** and low-cost, highly abundant, and environmentally friendly metal ions.
- Synthesis of **nanomaterials** (semiconductors, quantum dots, npsTiO₂ etc) acting as photosensitizers/photocatalysts
- DFT calculations**



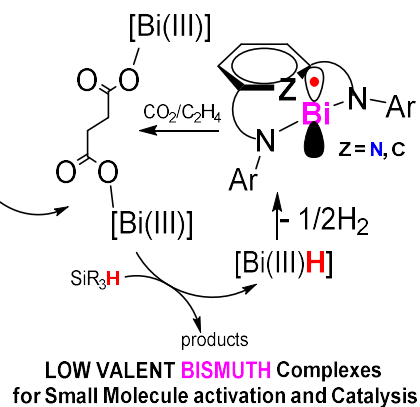
Photocatalytic nanoparticles based on quantum dots and TiO₂ for photodynamic therapies / applications

BIOMIMETIC AND ELECTROCATALYTIC ACTIVATION OF **METHANE**
USE OF CONCERTED ELECTRON PROTON TRANSFER IN ORGANOMETALLIC SYNTHESIS



NEW OXIDATION STATES
NEW PROPERTIES - MAGNETISM
f-element chemistry

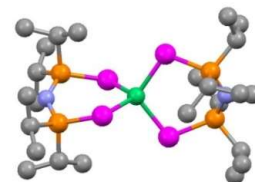
ORGANOMETALLIC
CHEMISTRY
@ N.K.U.A.
NT LAB



N. Tsoareas

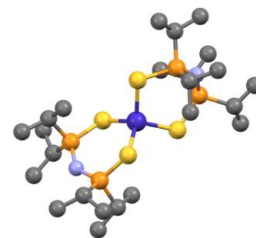
Metal complexes exhibiting characteristic magnetic properties

Tetrahedral, $S = 1$, $[\text{Ni}\{\text{iPr}_2\text{P}(\text{Se})\text{NP}(\text{Se})\text{iPr}_2\}_2]$, Large zero-field splitting: $D = 45 \text{ cm}^{-1}$



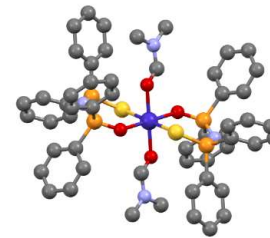
S.-D. Jiang, D. Maganas, N. Levesanos, E. Ferentinos, S. Haas, K. Thirunavukkuarasu, J. Krzystek, M. Dressel, L. Bogani, F. Neese, P. Kyritsis, *J. Am. Chem. Soc.*, **2015**, 137, 12923-12928.

3d-metal Single Ion Magnets



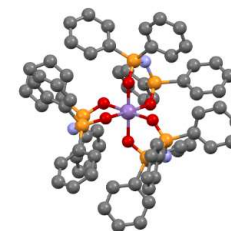
Tetrahedral
 $S = 3/2$,
 $[\text{Co}\{\text{iPr}_2\text{P}(\text{S})\text{NP}(\text{S})\text{iPr}_2\}_2]$

S. Sottini, G. Poneti, S. Ciattini, N. Levesanos, E. Ferentinos, J. Krzystek, L. Sorace, P. Kyritsis, *Inorg. Chem.*, **2016**, 55, 9537-9548.



Octahedral
 $S = 3/2$
 $\text{trans}-[\text{Co}\{\text{Ph}_2\text{P}(\text{O})\text{NP}(\text{S})\text{Ph}_2\}_2(\text{dmf})_2]$

E. Ferentinos, et al, *Inorg. Chem. Front.*, **2019**, 6, 1405-1414.



Octahedral
 $S = 2$,
 $[\text{Mn}\{\text{Ph}_2\text{P}(\text{O})\text{NP}(\text{O})\text{Ph}_2\}_3]$

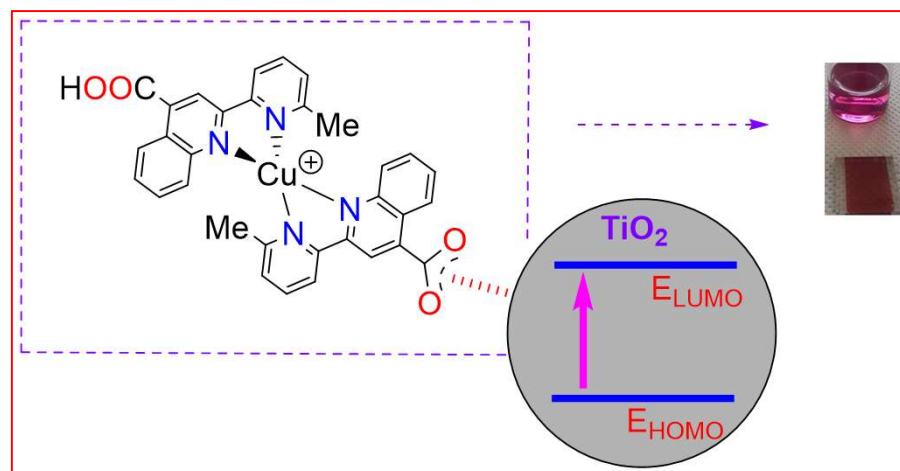
Y. Sanakis, et al, *Inorg. Chem.*, **2020**, 59, 13281-13294.

Panayotis Kyritsis

1

A nanocrystalline TiO_2 **Dye Sensitized Solar Cell** device consisting of a low-cost and easily prepared copper(I) molecular sensitizer, fabricated with commercially available materials, reaches a conversion efficiency of $\eta = 1.20\%$.

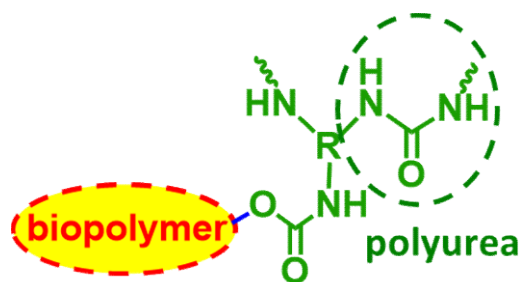
Dalton Trans. 51 (2022) 15049-15066, themed collection: *Spotlight Collection focused on Inorganic Chemistry in Greece*, “**hot article**”



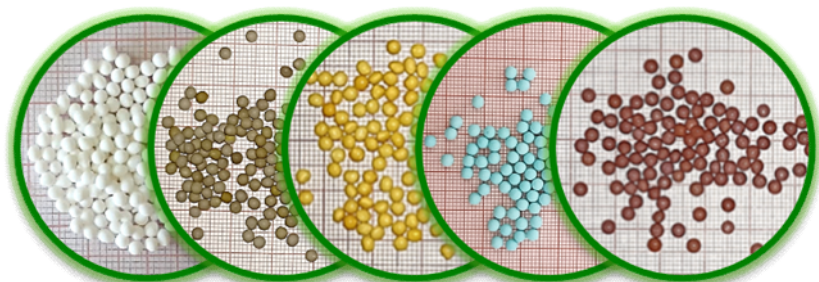
2

“**Inflammatory mediator inhibitors**” based on **transition metal complexes** constitute a recently coined term in the field of metal-based compounds with antiplatelet activities. **Our strategy** focuses on the Platelet-Activating Factor (PAF) as the target molecule, that is the most potent lipid mediator of inflammation. The antiplatelet potency of any substance is exerted by inhibiting the PAF-induced aggregation in washed rabbit platelets (WRPs), which is the most internationally accepted methodology.

Guest Editor, Special issue of Molecules entitled: “Antiplatelet and anti-inflammatory agents: Synthesis, Structures and Biological Evaluation”, 2023.



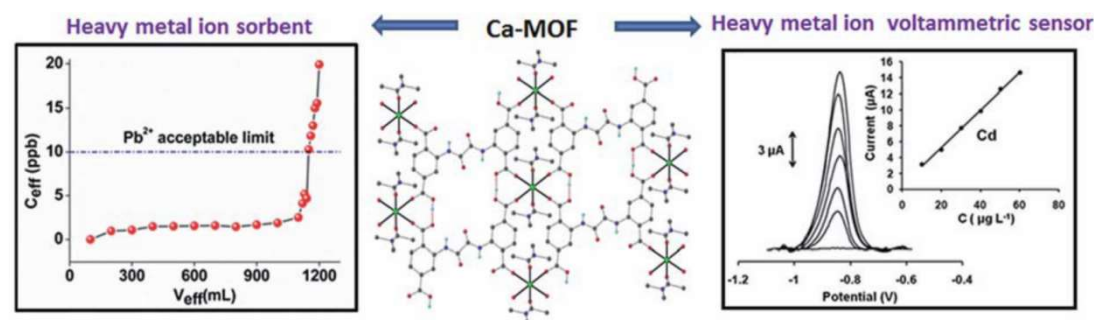
X-biopolymer aerogels



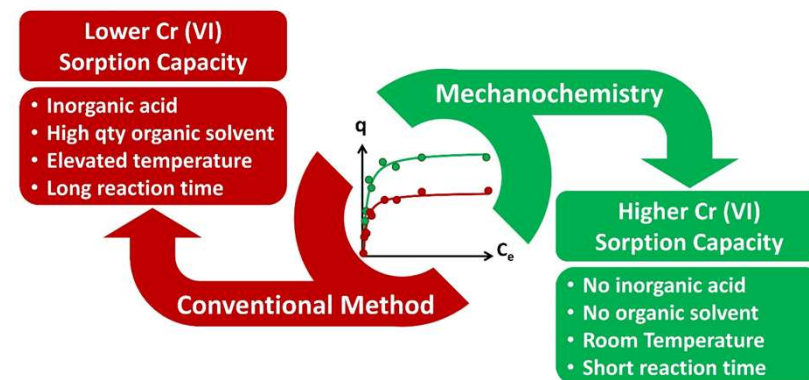
Polyurea-crosslinked biopolymer (X-biopolymer) aerogels

- a new class of lightweight nanostructured materials
- mechanically strong
- stable in all aqueous environments, including seawater
- biocompatible
- precursors for metal- and nitrogen-doped nanoporous carbons suitable for CO₂ capture and activation

P. Paraskevopoulou et al, EP3848409A1, 2021



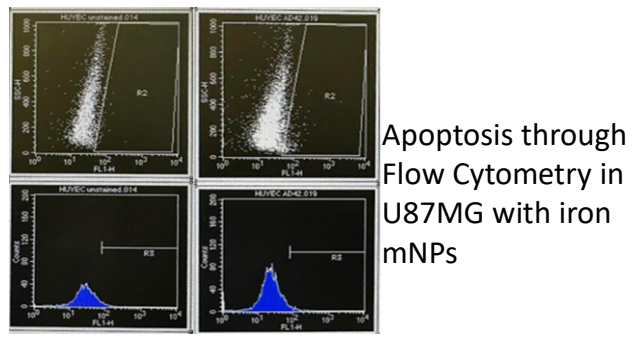
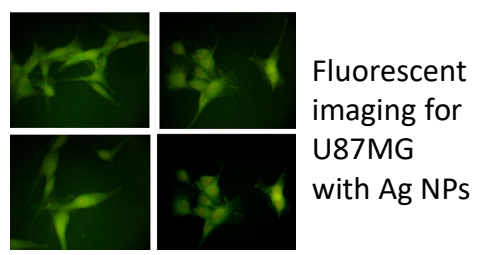
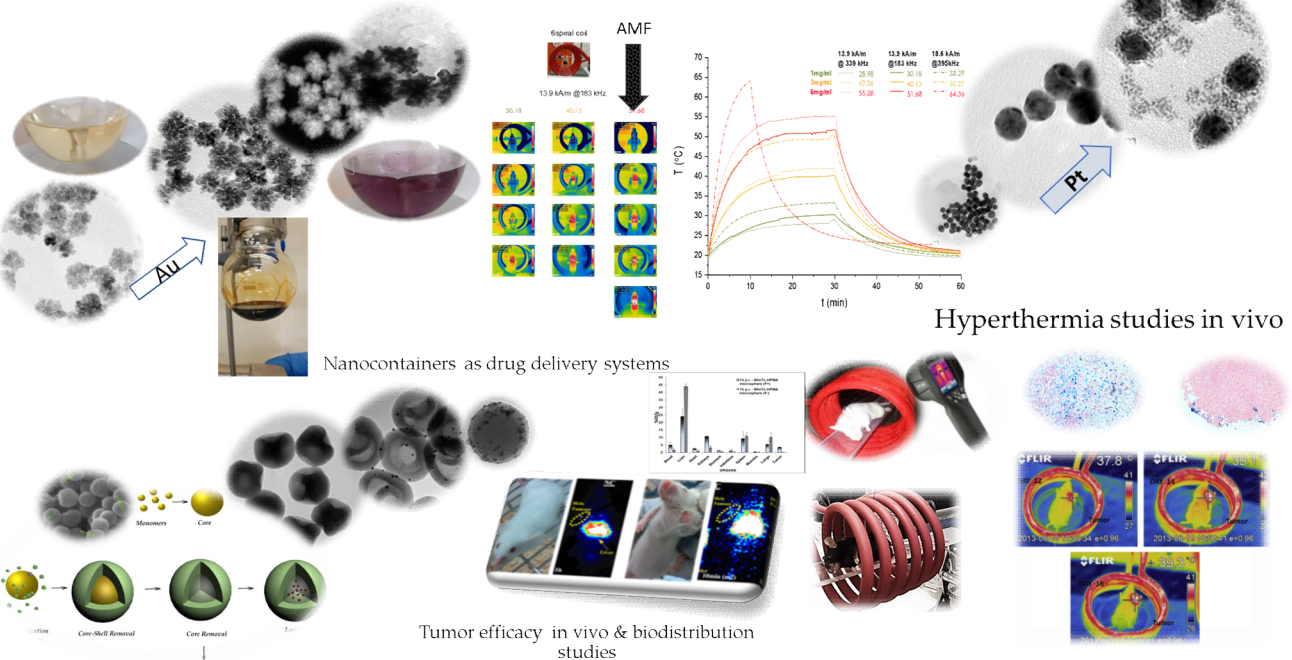
Metal-Organic Frameworks for water remediation



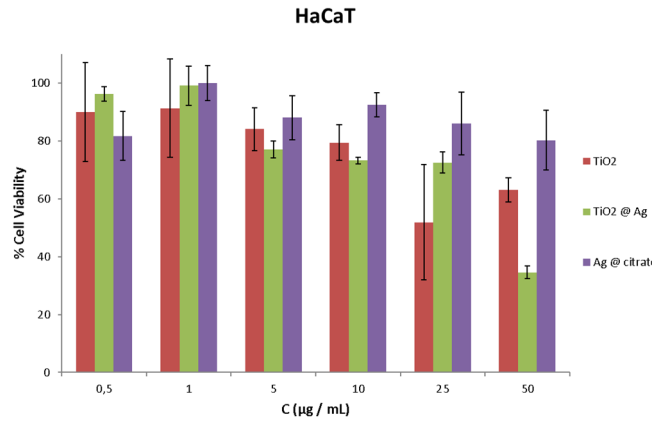
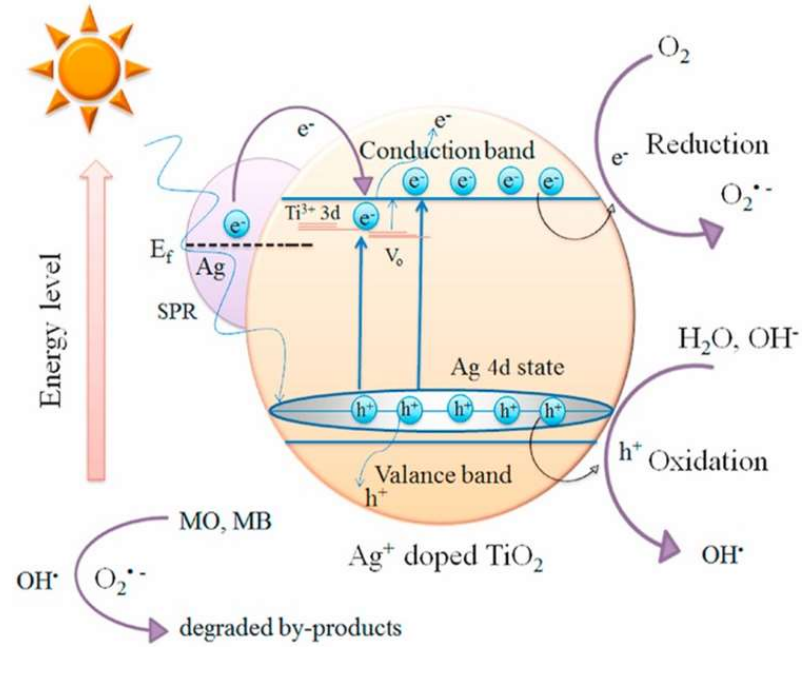
G.S. Papaefstathiou

Metallic and polymeric nanoparticles for theranostic applications

E. K. Efthimiadou, Synthesis of mNPLs coated with gold



Photocatalytic nanoparticles based on TiO₂



MTT assay toxicity study in HaCaT cell line

Analysis of Circulating Tumor Cells Lab (ACTC Lab)

(<http://www.actc-lab.chem.uoa.gr/>)

Liquid biopsy

Detection and molecular characterization of circulating tumor cells

Detection of circulating tumor DNA, MiRNAs, exosomes

The ACTC Lab has been accredited with an ISO 15189 certificate to perform liquid biopsy analysis.

Patents

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(54) Title: COMPOSITION AND METHOD FOR DETERMINATION OF CK19 EXPRESSION

Publications

[Preoperative Mutational Analysis of Circulating Tumor Cells \(CTCs\) and Plasma-cfDNA Provides Complementary Information for Early Prediction of Relapse: A Pilot Study in Early-Stage Non-Small Cell Lung Cancer](#), *Cancers* 2023, 15(6), 1877; <https://doi.org/10.3390/cancers15061877>

[Development and Analytical Validation of a 6-Plex Reverse Transcription Droplet Digital PCR Assay for the Absolute Quantification of Prostate Cancer Biomarkers in Circulating Tumor Cells of Patients with Metastatic Castration-Resistant Prostate Cancer](#), *Clin Chem.* 2022 Oct 6;68(10):1323-1335. doi: 10.1093/clinchem/hvac12

[Development and Analytical Validation of a One-Step Five-Plex RT-ddPCR Assay for the Quantification of SARS-CoV-2 Transcripts in Clinical Samples](#), *Anal Chem.* 2022 Sep 13;94(36):12314-12322. doi: 10.1021/acs.analchem.2c00868. Epub 2022 Aug 12.

Awards



Cancer Blood Scan Project



CANCER BLOOD SCAN (CBS) PROJECT

CANCER blood-scan (CBS) is a newly formed consortium funded by the "Competitiveness, Entrepreneurship and Innovation" (EPANIK) Operational Programme with academic leader Prof. Evri Lianidou, Professor of Analytical Chemistry – Clinical Chemistry, Department of Chemistry, NKUA. The program is attended by Assoc. Prof. A. Piyiri, Atikon Hospital, Medical School NKUA, Prof. Ch. Papadimitriou, Anestasio Hospital, Medical School NKUA, Prof. A. Stratigou, Syggros Hospital, Medical School NKUA, Prof. S. Kakoliris, Medical School DUTH, and the PHARMASIST Company. The total budget of the project reaches the amount of 893,058 EUR and its duration is three years.

The aim of the CANCER blood-scan project is the development and clinical validation of innovative methodologies for the detection of cancer biomarkers by liquid biopsy approach. A key goal of the CBS-project is to "translate" the results of basic research into new commercially available products, leading to the application of personalized therapy by liquid biopsy into the clinical routine. To achieve this, the research team brings together experts from the academic community, clinical research and company, thus contributing to the development and commercialization of in-vitro diagnostic products / kits, with the aim of establishing liquid biopsy in clinical practice.

Sensors Lab (<http://scholar.uoa.gr/christok>)

Fabrication of smart sensors and biosensors through microengineering, 3D-printing and other printing technologies.

Wearable sensors

Paper-based devices

Smart sensors

NEWS RELEASE 25-APR-2023

Say 'ahhh': This ecofriendly tongue depressor checks vitals

Peer-Reviewed Publication
AMERICAN CHEMICAL SOCIETY



Doctors often use tongue depressors when peering in a patient's mouth and throat. But what if that flat wooden spatula could actively evaluate the patient's health? That's the premise of an ecofriendly disposable sensor, reported in *ACS/ Analytical Chemistry*, that can check levels of glucose and other biomarkers in saliva. Researchers say the easy-to-produce device could someday help doctors assess a range of conditions.

Wood is a renewable, biodegradable, natural material that is widely available at low cost, which makes it attractive for researchers who design electronics and sensors. However, this is challenging because the material isn't good at conducting electricity. One solution is to use wood as a passive substrate and then coat it with metals and carbon-based inks.

Alternatively, high-power lasers can char specific regions on the wood, turning those spots into conductive graphite. But this complicated technique requires sophisticated and expensive instrumentation, an oxygen-free atmosphere and fire retardants. To develop a cheaper and easier process, Christos Kokkinos and colleagues turned to low-power diode lasers, which have already been successfully used to make polyimide-based sensors but haven't previously been applied to wooden electronics and electrochemical sensors.

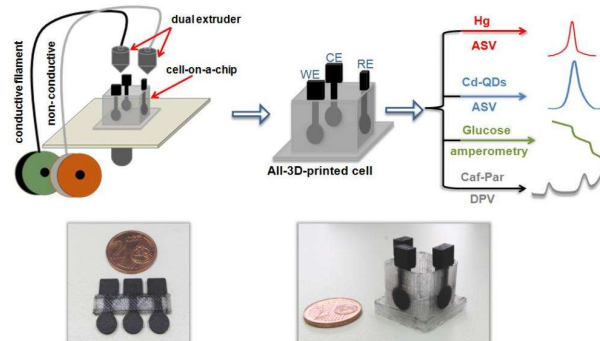
The team used a portable, low-cost laser engraver to create a pattern of conductive graphite electrodes on a wooden tongue depressor, without the need for special conditions. Those electrodes formed two electrochemical cells separated by lines drawn with a water-repellent permanent marker. The biosensor was then used to rapidly and simultaneously measure concentrations of nitrite and glucose in artificial saliva. Nitrite can reveal oral diseases, such as periodontitis, while glucose can serve as a diagnostic for diabetes. The researchers say these low-cost devices could be adapted to detect other saliva biomarkers and would be quick and easy to produce on-site at medical facilities.



IMAGE: ELECTROCHEMICAL CELLS ETCHED BY A LASER ON A WOODEN TONGUE DEPRESSOR CAN MEASURE GLUCOSE AND NITRITE LEVELS IN SALIVA. (WE = WORKING ELECTRODE, CE = COMMON COUNTER ELECTRODE, RE = COMMON REFERENCE ELECTRODE) [view more >](#)

CREDIT: ADAPTED FROM ANALYTICAL CHEMISTRY, 2023. DOI: 10.1021/ACS.ANALCHEM.3C01211

3D-printed Devices



Publications

"3D Printed Bioelectronic Microwells", Advanced Functional Materials, 2021,
DOI: <https://doi.org/10.1002/adfm.202102459>

"Smartphone-Addressable 3D-Printed Electrochemical Ring for Nonenzymatic Self-Monitoring of Glucose in Human Sweat" *Analytical Chemistry*, 2021, 93, 7, 3331–3336

"Paper-based microfluidic device with integrated sputtered electrodes for stripping voltammetric determination of DNA via quantum dot labeling" *Analytical Chemistry*, 2018, 90, 1092-109

Projects

SAFEMILK
Innovative technology for milk safety

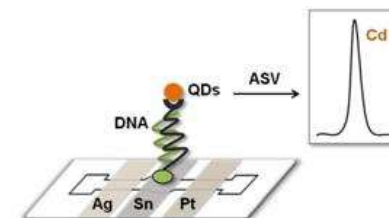


Making safer milk through innovative detection of bacteria and antibiotics

The EU-funded SAFEMILK project will develop a novel, complex biosensing assay for the evaluation of milk safety. The innovative solution will be focused on rapid and sensitive detection of bacterial pathogens and antibiotics that could occur in milk and represent a potential hazard for health. By applying surface acoustic waves, electrochemical and optical methods with the use of nanofabricated surfaces and immobilised DNA aptamers, SAFEMILK aims at creating an optimised complex assay for efficient assessment of milk safety, which could become a useful tool for the milk and dairy product industry.

For more information, please visit:
<https://cordis.europa.eu/project/id/101037299>

Paper-based devices



Trace Analysis and Mass Spectrometry (TrAMS) Group (<http://trams.chem.uoa.gr/>)

Foodomics

Mass Spectrometry

Chemometrics

Emerging Contaminants

Wastewater-based Epidemiology

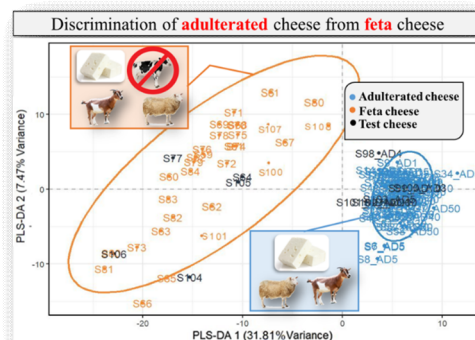
The Laboratory is accredited under EN ISO/IEC 17025 by the Hellenic Accreditation System S.A.

MALDI-TOF-MS



Food adulteration

Powerful tools have been developed for the detection of food adulteration combining metabolomic profiling, metabolomic fingerprinting and chemometrics



Projects

LIFE APEX Project (LIFE17 ENV/SK/000355)

The AIM of LIFE APEX is to improve the systematic use of chemical monitoring data from apex predators and prey for protecting human health and the environment.

The OBJECTIVES of LIFE APEX are:

- 1.To demonstrate four novel, regulatory applications of chemical monitoring data from apex predators and prey.
- 2.To support and sustain regulatory take-up of these applications.
- 3.To replicate and transfer LIFE APEX approaches and methods with partners across the Europe.
- 4.To disseminate and communicate the LIFE APEX approaches and methods and in particular optimize uptake by regulators and industry.

Project Coordinator: Dr. Slobodnik Jaroslav (Environmental Institute)

Project Duration: September 2018 – August 2022

Project budget: € 3.35M (EU LIFE funding 60%)

website: <https://lifeapex.eu/>



GC-APCI-QTOFMS



Publications

First Novel Workflow for Semiquantification of Emerging Contaminants in Environmental Samples Analyzed by Gas Chromatography–Atmospheric Pressure Chemical Ionization–Quadrupole Time of Flight–Mass Spectrometry”, *Analytical Chemistry*, **2022**, 94, 27, 9766–9774
 “ SARS-CoV-2 wastewater surveillance data can predict hospitalizations and ICU admissions” *Science of the Total Environment*, **2022**, 804, 150151 (doi: 10.1016/j.scitotenv.2021.150151)
 “Proteo-metabolomic journey across olive drupe development and maturation”, *Food Chemistry*, 2021, 363(7):130339 (doi:10.1016/j.foodchem.2021.130339)

**Laboratory of
Environmental Chemistry**

-

ENVIRONMENTAL CHEMISTRY LABORATORY

MAIN RESEARCH FIELDS



- Atmospheric pollution (sources, emissions, monitoring of primary and secondary pollutants in air and particulate phase)
- Development of analytical methods for the determination of atmospheric pollutants
- Quality assurance of atmospheric pollution measurements
- Impact of atmospheric pollution on human health (outdoor environment and indoor air)

Substrate...

Ambient air

Indoor air

Vehicle emissions

Industrial emissions

Shipping emissions

Water

Human serum

Human blood



Pollutants.....

Volatile Organic Compounds (VOCs)

Metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)

CH₄, CO, CO₂, HFCs, N₂O, NH₃, PFCs, SF₆, SO_x, NO_x

Carbonyl compounds

Organic and elemental carbon in suspended particles

Polycyclic Aromatic Hydrocarbons (PAHs)

Polychlorinated Biphenyls (PCBs)

Trihalomethanes

Chloroacetic acids

Ions

Atmospheric particles (PM₁₀, PM_{2.5})

Metabolites

ENVIRONMENTAL CHEMISTRY LABORATORY



(Inductively Coupled Plasma - Mass Spectrometer, Thermo ICAP-Qc)



GC-ToFMS
(GCT Premier, Waters)



Electrochemical Analyser
(Ecochemie)



Clean room



Flame Atomic Absorption Spectrometer
(Varian SpectrAA 200)



Graphite Furnace Atomic Absorption Spectrometer (Varian SpectrAA 640Z)



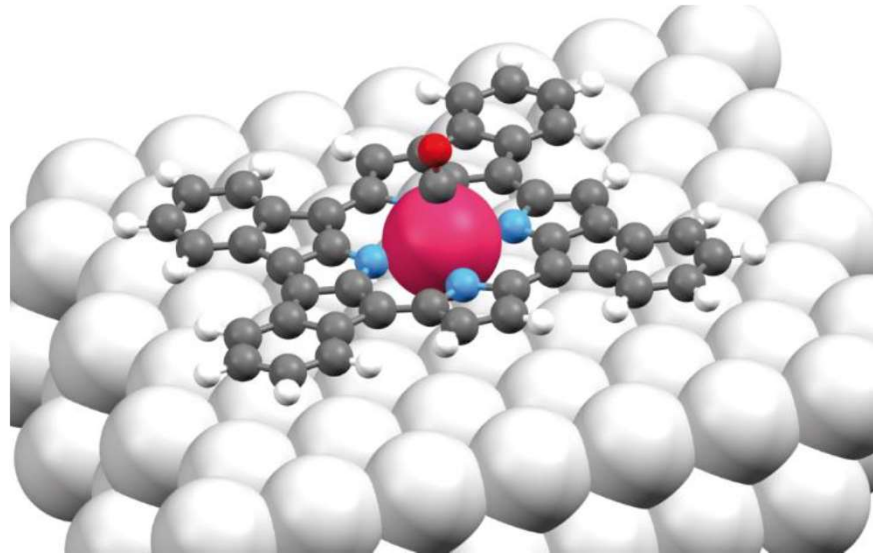
GC-MS
(6890/5973, Agilent)

Surface Science

Electrical & spectroscopic
study of spontaneously
charged films



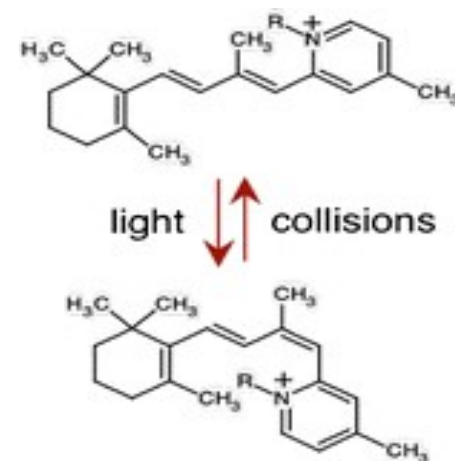
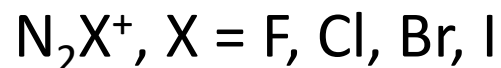
STM studies of molecular
constructs



Ru tetraphenyl porphyrin on Ag(111)

Computational studies

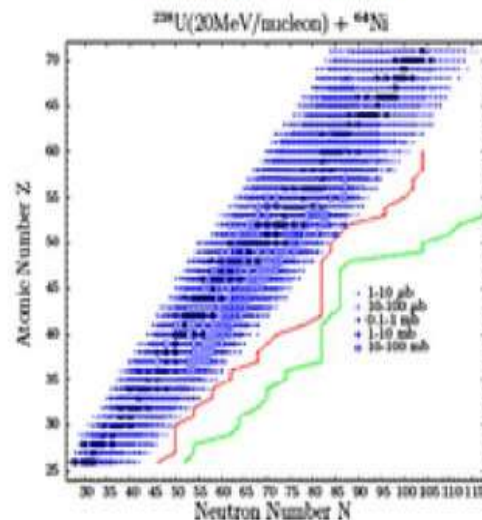
- High precision calculations on (unusual) small molecules
- Structure, energetics and reaction paths in complex systems
- Molecular dynamics simulations with charged species



Nuclear reactions: Experiments and modelling

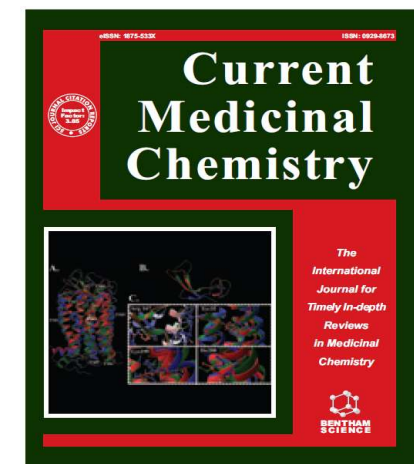
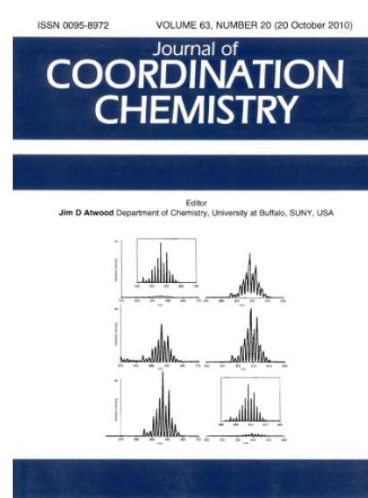
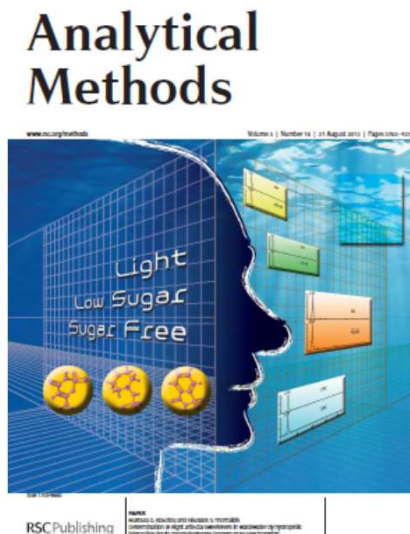
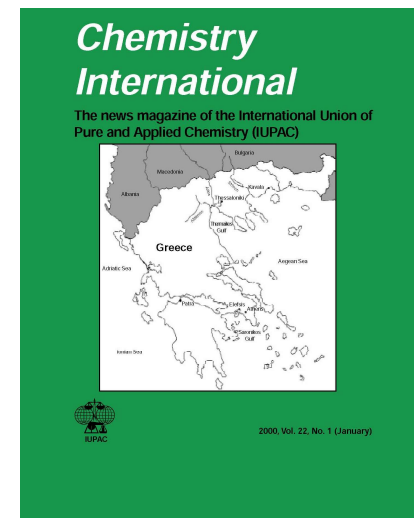
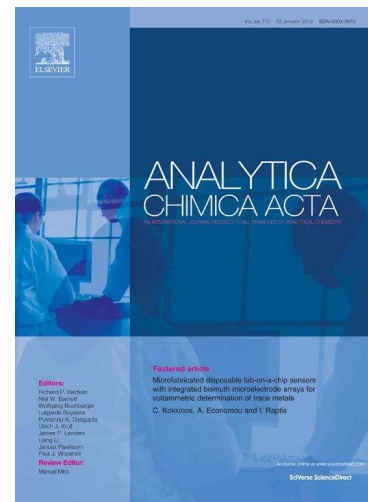
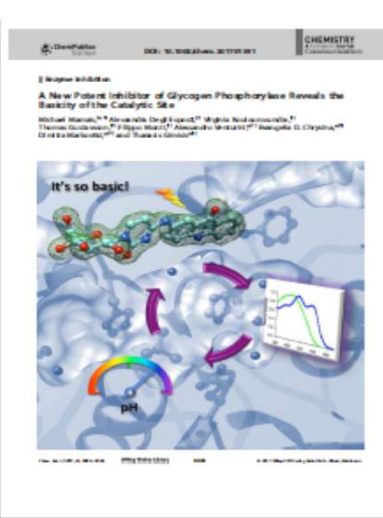
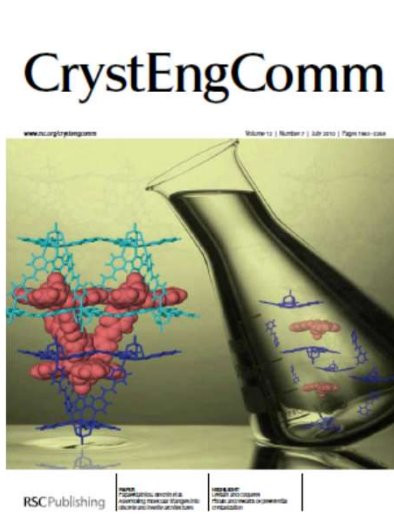
Simulations: ^{238}U (20 MeV/nucleon) + ^{64}Ni

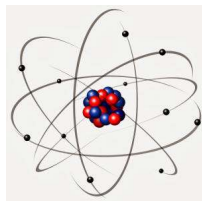
Production cross sections of
neutron-rich nuclides



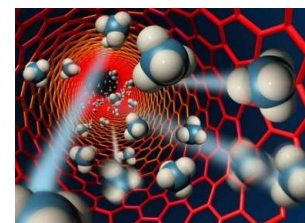
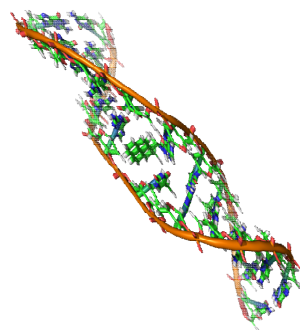
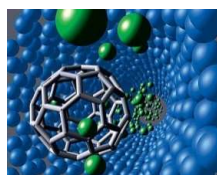
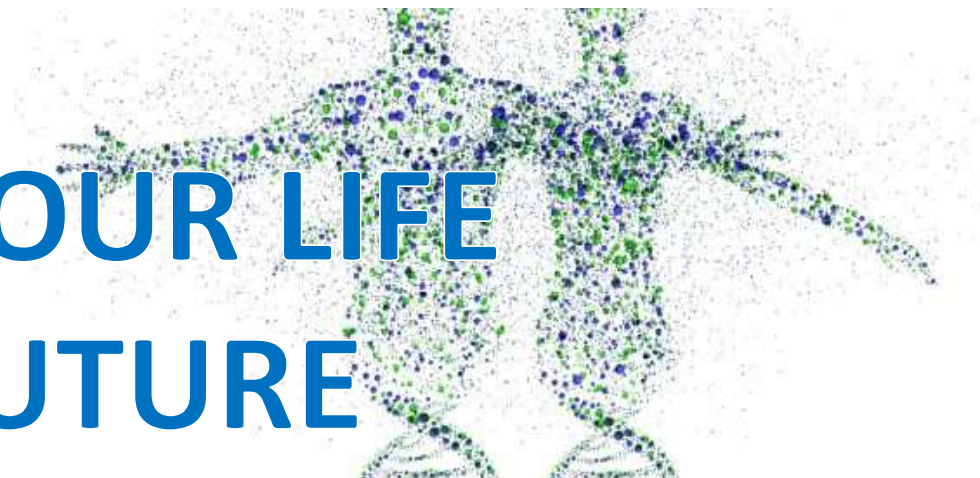
- N. Vonta, G. A. Souliotis, M. Veselsky, and A. Bonasera. “Microscopic dynamical description of proton-induced fission with the constrained molecular dynamics model”, [*Phys. Rev. C* **92**, 024616 \(2015\)](#).
- N. Vonta, G.A. Souliotis, et al; [*Phys. Rev. C* **94**, 064611 \(2016\)](#).

Journal Covers





CHEMISTRY IS OUR LIFE AND OUR FUTURE



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