



Physical Chemistry Laboratory, Aristotle University of Thessaloniki

Aristotle University

Scientific Activities and Accomplishments of the Laboratory of Physical Chemistry, AUTh

Sotiris Sotiropoulos

1st Aristotle Conference on Chemistry, ACC2023, Thessaloniki, November 2023





Outline

- The early days
- The “baby ('82 legislation) boomers” of the 80's
- The present
 - Staff
 - Research activities
 - Teaching Activities
 - Accomplishments
- The future



Aristotle University

The early days

- Founded in **1939** as one of the three laboratories that originated from the laboratory of General Chemistry (initially part of the School of Sciences), preceded the establishment of the Chemistry Department (**1943**)
- Initially housed with the rest of the Chemistry Department Laboratories in the basement of the School of Philosophy until relocated to the ground floor of the Old Chemistry Building in **1957**



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Aristotle University

The early days

- **Leandros Kapatos** was the first Professor of Physical Chemistry (1939-1970)
- Professor **Dimitrios Giannakoudakis** (appointed in 1970) shaped the future of the laboratory by promoting **electrochemical research** and appointing a number of **Research Assistants**

(Professor **George Stalidis** also served as an Assistant Professor during that period.)

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The baby boomers of the 80's

- University legislation introduced in **1982** allowed for Research Assistants to advance to **permanent members of staff**.
This made the Laboratory of Physical Chemistry one of the **largest and most dynamic** of its time.
- **Members of the staff** appointed following that period included:
I.Moumtzis, G.Papanastasiou, G.Kokkinidis*, G.Ritzoulis (the original “3Gs”), P.Mavridis, D.Panopoulos, E.Theodoridou, N.Missailides, P.Nikitas*, A.Papoutsis, A.Pappa-Louisi, A.Anastopoulos, I.Ziogas, A.Giannakoudakis, P.Giannakoudakis, N.Papadopoulos, D.Sazou*, M.Pagitsas) **(18)**
*(*included in the Stanford-Ioannidis list of top 2% researchers for career)*
- Theoretical and/or experimental work on the **physical chemistry of electrochemical systems**.



The present

- Academic Staff (memorandum aftermath(5+2))



A. Avranas



D. Gavriil



P. Nikitas



I. Poulios



D. Sazou



S. Sotiropoulos



D. Tsiplakides

- Teaching/Research/Technical Staff (lab work-horses/heroes)



A. Kouras



E. Manoli



E. Lazaridou



A. Banti

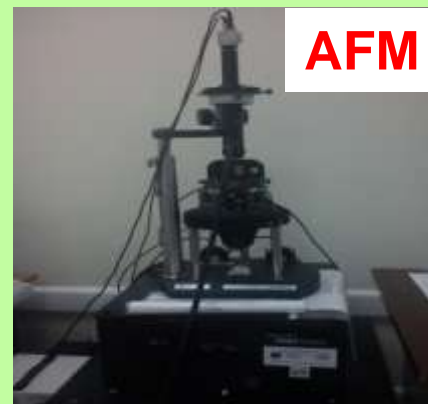
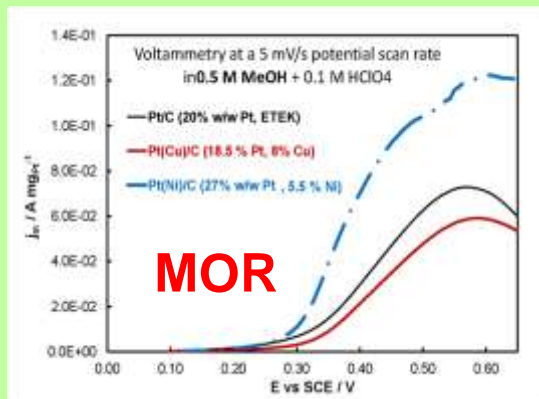
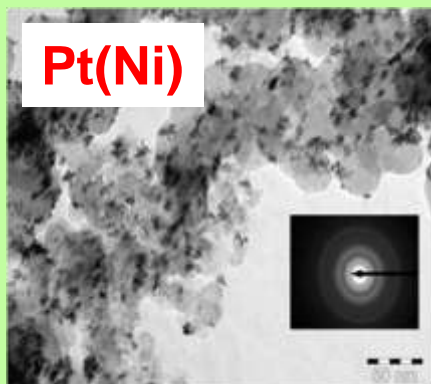


The present

➤ Research activities: Electrochemistry

Electrocatalysis

- Preparation, characterization and electrochemical activity of **electrocatalysts** with emphasis to fuel cell, electrolysis and supercapacitor-related reactions.
- Scanning Probe Microscopies (**AFM, SECM**) with emphasis to the study of electrocatalysts and photocatalysts.



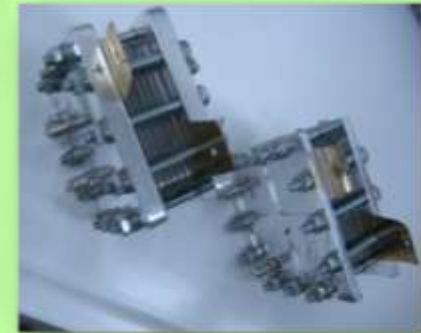
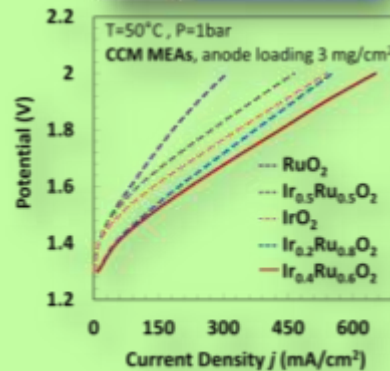
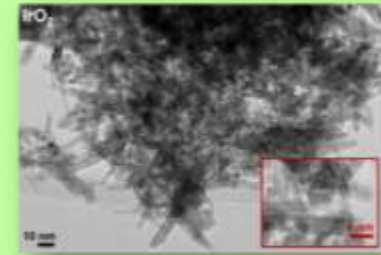
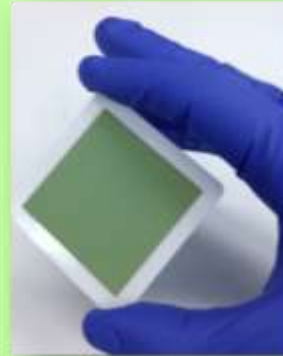


The present

- Research activities: **Electrochemistry**

Fuel Cells and Lithium-ion Batteries

- Polymer Membrane Electrolyte (PEM) and Solid Oxide Fuel Cells (SOFC)
- PEM and Solid Oxide **Electrolysers**
- **Lithium-ion batteries.**



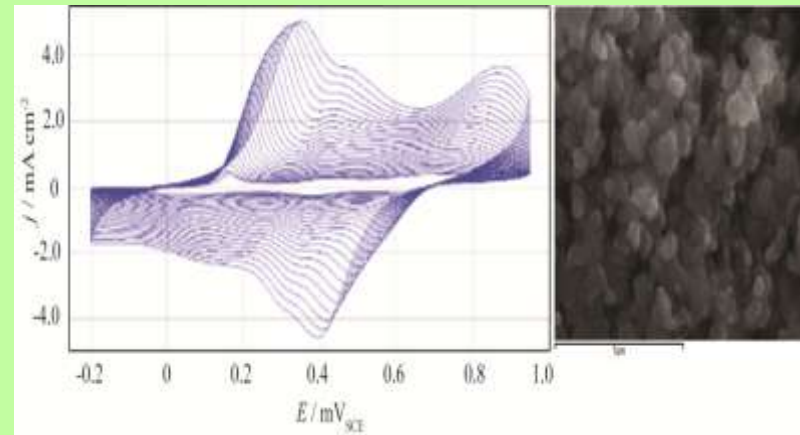
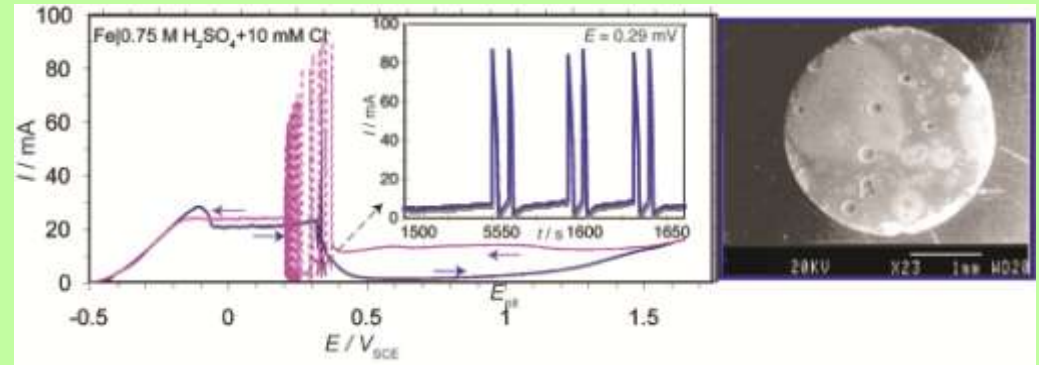


The present

➤ Research activities: Electrochemistry

Electrochemical Corrosion and Passivity of Metals and Alloys

- Processes underlying the corrosion and passivity of metals and alloys.
- Growth mechanisms of oxide layers (point defect models).
- Self-organization phenomena in nonlinear dynamical systems.
- Electrochemical synthesis of intrinsically conducting polymers (ICPs)- application in corrosion protection



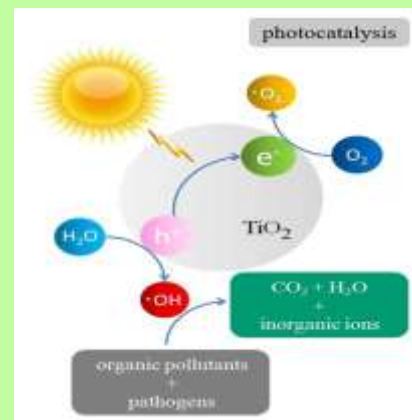


The present

➤ Research activities: Photo(electro)chemistry

Photoelectrochemistry of semiconductors - Photocatalysis

- Heterogeneous and Homogeneous Photocatalysis; Solar Detoxification and Disinfection of Wastewaters, Drinking Water and Air; hydrogen production.
- Photoelectrocatalysis with emphasis to electrochemically-assisted photo-oxidation of organics.





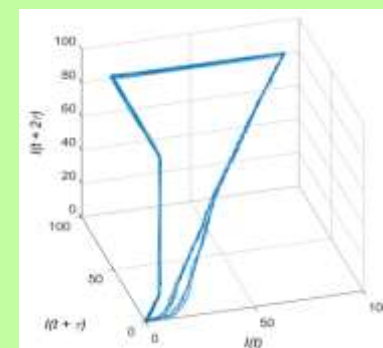
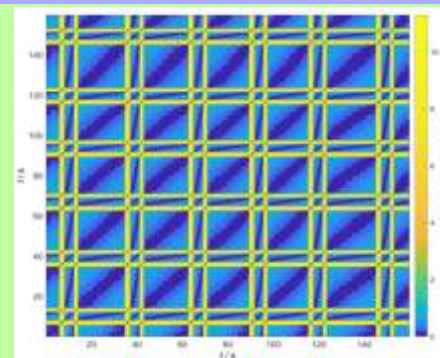
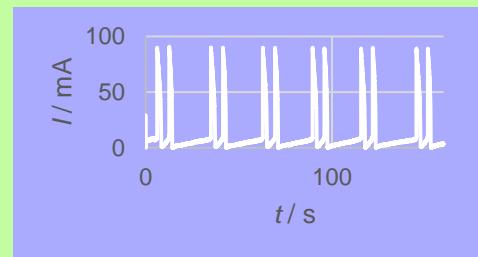
The present

➤ Research activities: Physical Chemistry

- Physical Chemistry of Interfaces and **adsorption of surfactants**

- Physicochemical measurements **by chromatographic methods** (Reverse Flow Gas Chromatography, Fields Flow fractionation)

- **Nonlinear dynamics** of physicochemical systems far from equilibrium





The present

- Research activities: State, European and Industrial Funding

Selection of recently/currently funded projects

- From solar energy to fuel: A hollistic artificial photosynthesis platform to prodice viable solar fuels, **HORIZON 2023**
- Cu-Ni Barrel-plating of coins, **Roda Ltd**
- Optimization of sea-water electro dialysis for rhenal wash-solution preparation-OPTATHOMER, **Pharmacosmetic Ltd-GSRT**
- Electrochemical treatment of wastewaters-INVALOR, **GSRT**
- Photocatalytic neutralization of pathogens on titanium dioxide-graphene composites, **GSRT**
- Photocatalytic neutralization of hazardous medical wastes- Photolnact, **GSRT**
- Pilot scale hydrogen and electrical energy production from biomass- Eco-Bio-H₂-FCs, **GSRT**
- “Development of new electrode materials & understanding of degradation mechanisms on Solid Oxide Electrolysis Cells (SELySOs)” **FCH-JU, Horizon 2020**
- Scale-up of NEMCA effect-based catalytic hydrogenation of CO₂ for fuel production (CO₂-TO-FUELS), **GSRT**
- “Development of new electrode materials & understanding of degradation mechanisms on Solid Oxide Electrolysis Cells (SELySOs)” **FCH-JU, Horizon 2020**

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The present

➤ Teaching activities: **Undergraduate Courses**

- **Physical Chemistry** and **Electrochemistry** lecture and laboratory Courses to **Chemistry**, **Pharmacy** and **Biology** students.
- More than **800 students taught/trained** per year



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The present

➤ Accomplishments: Group achievements

- Average number of publications per member of the Lab >100, average H-Index >32, average number of citations > 4000 (Google Scholar)
- The only MSc course on Electrochemistry nationwide.
- Teaching/training >800 students from 3 Schools
- Organisation of 2 International Conferences with 500 (8th European Meeting on Solar Chemistry and Photocatalysis) and 1000 (55th ISE Annual Meeting) participants

➤ Accomplishments: Individual achievements

- I.Poulios: pioneer of photocatalysis in Greece (9891 citations, H-index=48)
- D.Sazou: included in the Stanford-Ioannidis list of top 2% researchers
- S.Sotiropoulos: Editor in Electrochimica Acta (Elsevier) for more than 16yrs
- D.Tsiplakides: Annual research project income of more than 400K€

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Aristotle University

The present

- **Greatest Accomplishment: A truly academic atmosphere, defiant of the frantic requirements of modern “excellence”**



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The future (Lab united, never defeated)



**Ioannis
Kartsonakis**
(NTUA)



**Vasilios
Binas**
(IESL/FORTHNET)



**Ioannis
Katsounaros**
(Exxon Mobil)



**Panagiotis
Trogadas**
(UCL)