Christos Vaitsis

Curriculum Vitae

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Google Scholar

WORK EXPERIENCE

5/2023 – PRESENT (FT)

NCSR "Demokritos", INN, Materials and Membranes for Environmental Separations Laboratory (MESL)

Postdoctoral Researcher

- ◊ Advanced methodologies for the synthesis of nanoporous materials (Activated Carbons, ordered mesoporous silicas and carbons, Metal Organic Frameworks and Composites)
- ◊ Structural/physicochemical characterization of materials with a range of techniques (FT-IR, Raman, XRD, SAXS/WAXS, TGA/DSC, electron microscopy)
- ◊ Gas sorption-based studies (N_2/Ar/CO_2 porosimetry) for the accurate evaluation of the pore properties of nanoporous materials
- ◊ Gas sorption-based studies using special volumetric and gravimetric methods for the assessment of the gas (H_2, CO_2) storage and separation properties of materials at different temperatures and pressures

NTUA, School of Chemical Engineering, LIMT

2022 – 2024 (PT)

External Collaborator

- ◊ Methodology development and experiment design for the synthesis of MOFs, nanocomposites and perovskites
- ◊ Thesis supervision of 1 postgraduate & 2 pregraduate students

2016 – 2022 (FT)

Research Associate & Lab Teaching Instructor

- ◊ Doctoral research
- ◊ Teaching of 3 lab classes
- ◊ Thesis supervision of 9 postgraduate & 2 pregraduate students – Synthesis of MOFs, oxides, NPs, nanocomposites, applied to electrocatalysis (CO_2RR, Zn-air batteries, supercapacitors) and photocatalysis (dye degradation)
- ◊ 6 journal publications & 6 book chapters
- ◊ 9 participations in international & 5 in national conferences
- ◊ Research projects budget management & responsible for total reagents/supplies orders

10/2015 – 02/2016 (PT)

NTUA, School of Chemical Engineering, Lab of Organic Chemistry

Research Assistant

EDUCATION

2016 – 2022 **Chemical Engineering, PhD**
Laboratory of Inorganic Materials Technology
School of Chemical Engineering, NTUA

2010 – 2015 **Bachelor/Master of Chemical Engineering**
School of Chemical Engineering
National Technical University of Athens

LANGUAGES

Greek

Native Language

English

Certificate of Proficiency in English (2008)

French

Diplôme approfondi de Langue Française DALF C2 (2012)

JOB-RELATED SKILLS

- ❖ Fields of Expertise: Materials Chemistry, Sonochemistry, Organometallic Chemistry, Crystallography, Porous Materials (MOFs, Silicates, Carbons) & Nanoparticles/Nanocomposites synthesis, Gas Storage/Separation, Electrocatalysis, Photocatalysis, CO_2 Conversion
- ❖ Materials Characterization & Data Analysis via XRD/SAXS (Rietveld), TGA/DSC, SEM, Porosimetry, FT-IR, Raman, NMR, GC, HPLC, UV-Vis, DLS

COMPUTER SKILLS

- ●●●●● MS Office (Word, Excel, Powerpoint, Outlook) MS Windows
- ●●●●○ OriginPro, Studio One
- ●●●○○ Adobe Premiere, InDesign, Python
- ●●○○○ Adobe Photoshop/Lightroom, Illustrator LaTeX, WordPress
- ●○○○○ Adobe After Effects, Fortran, MATLAB, R

- ◊ Building on the work of my diploma thesis, leading to the publication of the research
- ◊ Synthesis of bis-(β-dicarbonyl)-methane products by using ionic liquids (IL) and deep eutectic solvents (DES) as solvents and catalysts
- ◊ Examination of DES recyclability

09/03/2015 – 24/04/2015 (FT)

VIANEX S.A.

Internship in the quality control department

- ◊ Training in analytical methods (FT-IR, UV, HPLC, TLC, TOC)
- ◊ Quality control of raw materials and final products

2011 – 2015 (PT)

Freelancing

Data Entry

Medical research questionnaire data entry in Microsoft Excel

DOCTORAL RESEARCH

"Sonochemical Synthesis of Metal Organic Frameworks (MOFs) for electrocatalytic applications"

This research was focused on the synthesis of MOFs via sonochemistry, along with a comparison with conventional methods. Various metals (transition & alkaline earth) and organic linkers were combined, while the effects of ultrasounds were examined during their preparation in terms of crystallinity (XRD), particle size (SEM) and thermal stability (TGA). Selected MOFs were tested for their electrocatalytic activity towards CO_2 reduction and Zn-air batteries.

- ✠ Ultrasound conditions optimization for the MOFs preparation in order to achieve shorter reaction times, smaller particle size and improved final properties
- ✠ 5 sonochemical preparations were new in the literature
- ✠ Full development of the CO_2RR electrochemical setup, including the cell design, electrochemical protocols and GC methods

* The research has been funded (for 4 years) by NTUA Research Committee scholarship

LAB CLASSES TEACHING

Teaching of pre-graduate and post-graduate laboratory classes in LIMT, School of Chemical Engineering, NTUA

Electrophoretic Deposition

for the pre-graduate lesson "Design of Inorganic and Electrochemical Industries" of 8th semester

Electroceramic synthesis

for the pre-graduate lesson "New Inorganic Materials Production Processes" of 9th semester

Preparation and Characterization of Ceramic Materials

Designed experiments and exercises for the "Materials Science and Technology" Interdepartmental Postgraduate Courses

THESIS SUPERVISION

Postgraduate Students [10]

2023 Sonochemical Synthesis and Characterization of Zr-based MOFs

2022 Sonochemical synthesis of MOFs for the Electrochemical Reduction of CO_2

MOFs and Derived Materials for Supercapacitors

2021 High-Pressure Reactor Building and Evaluation for Photocatalytic Applications with new materials

2019 Sonoelectrochemical Synthesis of mono- and bi-metallic Nanoparticles for Catalytic Applications

Synthesis of mono- and bi-metallic Nanoparticles via continuous and pulse Sonoelectrochemistry for Photocatalytic Applications

Optimization of Zinc-Air Batteries and Synthesis of Polymer Separation Membranes for the Prevention of Dendrite Formation

2018 Synthesis and Characterization of Semiconductor-based Nanocomposites for Photocatalytic Applications

Photocatalytic Degradation Study of Organic dyes in the presence of Ultrasounds

Sonochemical Synthesis of Indium Nitride and Titania Composites for Photocatalytic Applications

Pregraduate Students [4]

2023 Synthesis of MOF/Carbon composites for the Electrochemical Reduction of CO_2

Sonochemical Synthesis and Characterization of graphene-based nanocomposites for Zinc-Air Batteries

MOFs and composites for Supercapacitors

2018 Synthesis and Characterization of new MOFs with specific properties

TRAINING & CERTIFICATION

05–06/2021 Webinar Series | NCSR Demokritos
SPECTROSCOPY DAYS
NMR | FTIR/Raman | Mossbauer/EPR
XRF/XPS | XRD/Rietveld

09–10/2020 Webinar Series Summer School | NTUA
BIOCON-CO_2 – CO_2OLING THE EARTH

11–12/2019 Seminar Series | NCSR Demokritos
MICROSCOPY TECHNIQUES :
THEORY & APPLICATIONS
1. Optical & Confocal Microscopy
2. Electron Microscopy
3. Atomic Force Microscopy
4. Microscope Image Analysis and Nanometrology

✠ Member of the Technical Chamber of Greece

RESEARCH PROJECTS

02/2024–12/2025 Advanced H_2 Storage Materials with Enhanced Adsorption Properties and Optimal Working Capacities (HEAD) [Hellenic Foundation for Research & Innovation (H.F.R.I)]
WPs 2,4,5: Synthesis and Characterization of Activated Carbons | High Pressure H_2 Storage Measurements

PUBLICATIONS [13]

Google Scholar Citations: 983 *h-index: 8*

Journals [7]

Vaitsis C, Kanellou E, Pandis P.K, Papamichael I, Sourkouni G, Zorpas A, Argirusis C. Sonochemical synthesis of zinc adipate Metal-Organic Framework (MOF) for the electrochemical reduction of CO_2: MOF and Circular Economy, *Sustainable Chemistry and Pharmacy*, **2022**, *29*, 100786 (IF: 6.0)

Mechili M, **Vaitsis C**, Argirusis N, Pandis P.K, Sourkouni G, Zorpas A, Argirusis C. Research progress in Metal-Organic Framework Based Nanomaterials applied in Battery Cathodes, *Energies*, **2022**, *15(15)*, 5460 (IF: 3.2)

Mechili M, **Vaitsis C**, Argirusis N, Pandis P.K, Sourkouni G, Argirusis C. Research progress in transition metal oxide based bifunctional electrocatalysts for aqueous electrically rechargeable Zinc-Air Batteries, *Renewable and Sustainable Energy Reviews*, **2022**, *156*, 111970 (IF: 15.9)

Pandis P.K, Kalogirou C, Kanellou E, **Vaitsis C**, Savvidou M, Sourkouni G, Argirusis C. Key Points of Advanced Oxidation Processes (AOPs) for Wastewater, Organic Pollutants and Pharmaceutical Waste Treatment: A Mini Review, *ChemEngineering*, **2022**, *6*, 8 (IF: 2.5)

Tzani A, **Vaitsis C**, Kritsi E, Smiljkovic M, Sokovic M, Zoumpoulakis P, Detsi A. Green synthesis of bis-(β-dicarbonyl)-methane derivatives and biological evaluation as putative anticandidial agents, *Journal of Molecular Structure*, **2020**, *1216*, 128276 (IF: 3.8)

Vaitsis C, Sourkouni G, Argirusis C. Metal Organic Frameworks (MOFs) and ultrasound : A review, *Ultrasonics Sonochemistry*, **2019**, *52*, 106-119 (IF: 8.4)

Vayenas M, **Vaitsis C**, Sourkouni G, Pandis P.K, Argirusis C. Investigation of alternative materials as bifunctional catalysts for electrochemical applications, *Chimica Techno Acta*, **2019**, *6*, 120-129

Book Chapters [6]

Vaitsis C, Mechili M, Argirusis N, Pandis P.K, Sourkouni G, Argirusis C. "Chapter 10: MOF nanomaterials for cathodes" in *Metal-organic Framework-based Nanomaterials for Energy Conversion and Storage*, Elsevier, **2022**, 207-226

Vaitsis C, Kanellou E, Angelara C, Argirusis N, Pandis P.K, Sourkouni G, Zorpas A, Karantonis A, Argirusis C. "Chapter 18: MOFs-metal oxides/sulfide/phosphide nanocomposites for supercapacitors" in *Metal-organic Framework-based Nanomaterials for Energy Conversion and Storage*, Elsevier, **2022**, 393-412

Vaitsis C, Mechili M, Argirusis N, Pandis P, Sourkouni G, Argirusis C. "Chapter 26: Recent development in COF based materials for supercapacitors" in *Covalent Organic Frameworks: Chemistry, Properties, and Energy Applications for Sustainable Future*, CRC Press, **2022**, 449-464

Mechili M, **Vaitsis C**, Argirusis N, Pandis P, Sourkouni G, Argirusis C. "Chapter 15: Metal-air batteries based on nanostructured COFs" in *Covalent Organic Frameworks: Chemistry, Properties, and Energy Applications for Sustainable Future*, CRC Press, **2022**, 251-268

Vaitsis C, Mechili M, Argirusis N, Kanellou E, Pandis P, Sourkouni G, Zorpas A, Argirusis C. "Chapter 5: Ultrasound-assisted preparation methods of nanoparticles for energy-related applications" in *Nanotechnology and the Environment*, IntechOpen, **2020**, 77-103

Vaitsis C, Sourkouni G, Argirusis C. "Chapter 11: Sonochemical Synthesis of MOFs" in Mozafari M. (ed) *Metal-Organic Frameworks for Biomedical Applications*, Woodhead Publishing-Elsevier, **2020**, 223-244

CONFERENCES (INTERNATIONAL)

Oral Presentations [2]

Kanellou E, Dedeletaki E, **Vaitsis C**, Pandis P.K, Sourkouni G, Zorpas A, Argirusis C. "Sonochemical synthesis of metal oxides/sulfides and their composites for the sonophotocatalytic degradation of organic pollutants", 9th International Conference on Sustainable Solid Waste Management, 15-18 June **2022**, Corfu, Greece.

Vaitsis C, Kanellou E, Pandis P.K, Zorpas A, Sourkouni G, Argirusis C. "Green sonochemical route for the synthesis of MOFs for the electrochemical reduction of CO_2", 17th International Conference on Environmental Science and Technology (CEST), 1-4 September **2021**, Athens, Greece.

Posters [10]

Vaitsis C, Tampaxis C, Firgiolas K, Charalambopoulou G, Steriotis T. "Coffee-based activated carbons with enhanced gravimetric and volumetric cryo-adsorptive hydrogen storage properties", 15th Fundamentals of Adsorption, 18-23 May **2025**, Porto, Portugal.

Vaitsis C, Sourkouni G, Argirusis C. "Sonochemical Synthesis of Alkaline Earth (Mg, Ca, Sr) Metal-Organic Frameworks (MOFs) based on 2,5-Dihydroxy Terephthalic Acid", 15th Meeting of the European Society of Sonochemistry, 28 August - 1 September **2022**, Jena, Germany.

Kanellou E, **Vaitsis C**, Pandis P.K, Sourkouni G, Zorpas A, Argirusis C. "Ultrasound-assisted method for the Synthesis of Alkaline Earth Perovskites (Ba,Sr) based on ZrO_2", 15th Meeting of the European Society of Sonochemistry, 28 August - 1 September **2022**, Jena, Germany.

Vaitsis C, Kokkoris G, Kanellou E, Pandis P.K, Höfft O, Sourkouni G, Argirusis C. "Effects of synthesis conditions on the sonochemical preparation of Co-MOF-74", 1st ESS-JSS-AOSS Joint Sonochemistry Conference, 8-10 November **2021**, online.

Kanellou E, **Vaitsis C**, Pandis P.K, Sourkouni G, Zorpas A, Argirusis C. "Sonochemical synthesis of metal oxides, metal sulfides and their composites for the photocatalytic degradation of organic pollutants", 1st ESS-JSS-AOSS Joint Sonochemistry Conference, 8-10 November **2021**, online.

Kanellou E, **Vaitsis C**, Chantzakou V, Pandis P.K, Sourkouni G, Zorpas A.A, Argirusis C. "Preparation, Modification and Characterization of Composites for Photocatalytic Waste Treatment Applications", Open Earth Conference, 12-14 February **2020**, Thessaloniki, Greece.

Davellas R, **Vaitsis C**, Sourkouni G, Argirusis C."Study of Photocatalytic Degradation of Organic Pollutants in the Presence of Ultrasound", Open Earth Conference, 12-14 February **2020**, Thessaloniki, Greece.

Vaitsis C, Tzani A, Detsi A, Sourkouni G, Argirusis C. "Ultrasound and/or Microwave-Assisted Preparation of Metal Organic Frameworks", 15th Meeting of the European Society of Sonochemistry, 27 June - 1 July **2016**, Instabul, Turkey.

Tzani A, **Vaitsis C**, Detsi A. "Deep Eutectic Solvents as Sustainable Media for Multicomponent Reactions", Green & Sustainable Chemistry Conference, 3-6 April **2016**, Berlin, Germany.

Tzani A, **Vaitsis C**, Sepyrgioti E, Detsi A. "Green and efficient synthesis of novel bis-(β-dicarbonyl)- methane derivatives catalyzed by Ionic Liquids and deep eutectic solvent", International Conference "Science in Technology" SCinTE, 5-7 November **2015,** Athens, Greece.

CONFERENCES (NATIONAL)

Posters [6]

Angelara C, **Vaitsis C**, Pandis P.K, Sourkouni G, Karantonis A, Argirusis C. "Enhancing the Performance of CNT@CoZn- MOF Anodic Electrodes for Hybrid Supercapacitor Cells through CNT Pre-treatment", 2nd Panhellenic Workshop on Inorganic Chemistry, 28-30 September **2023**, Athens, Greece.

Vayenas M, **Vaitsis C**, Sourkouni G, Argirusis C. "Use of Metal Organic Frameworks (MOFs) in Rechargeable Zinc-Air Batteries", 12th Panhellenic Scientific Conference in Chemical Engineering, 29-31 May **2019**, Athens, Greece.

Kanellou E, **Vaitsis C**, Sourkouni G, Argirusis C. "Sonochemical Synthesis of Semiconductors for Photocatalytic Applications", 12th Panhellenic Scientific Conference in Chemical Engineering, 29- 31 May **2019**, Athens, Greece.

Davellas R, **Vaitsis C**, Sourkouni G, Argirusis C, "Study of Photocatalytic Degradation of Organic Pollutants in the Presence of Ultrasound", 12th Panhellenic Scientific Conference in Chemical Engineering, 29-31 May **2019**, Athens, Greece.

Dimitriou E, Giakoub A, **Vaitsis C**, Pandis P.K, Sourkouni G, Argirusis C. "Sonoelectrochemical Synthesis of Monometallic and Bimetallic Nanoparticles", 12th Panhellenic Scientific Conference in Chemical Engineering, 29-31 May **2019,** Athens, Greece.

Vaitsis C, Sourkouni G, Argirusis C. "Sonochemical Synthesis of Metal Organic Frameworks (MOFs)", 11th Panhellenic Scientific Conference in Chemical Engineering, 25-27 May **2017**, Thessaloniki, Greece.