Curriculum Vitae

Research and Scientific Activity

Dr Ioanna (Joan) Papavasiliou

Last update: November 2023

BRIEF CURRICULUM VITAE

Personal

Name/Surname: Ioanna (Joan) Papavasiliou

Office address (1): Laboratory of Electrochemical Energy Applications (ECEA Lab)
Department of Chemical Engineering
University of Patras
Patras, 26504
E-mail: ipapavas@upatras.gr; ipapavas@chemeng.upatras.gr

Education

- **2003-2008:** **Department of Chemical Engineering, University of Patras & FORTH/ICE-HT**,
  Patras, Greece
  Ph. D in Chemical Engineering, University of Patras (Date of Ph. D defense: May 2008)
  Thesis: "Production of hydrogen via methanol reforming over copper oxide catalysts",
  Advisor: Prof. P.G. Koutsoukos
- **2003-2008:** **Department of Chemical Engineering, University of Patras & FORTH/ICE-HT**,
  Patras, Greece
  M.Sc. in Energy and Environment, University of Patras (May 2008), *Grade*: 9/10
  Advisor: Prof. P.G. Koutsoukos
- **1997-2003:** **University of Patras**, Patras, Greece,
  Diploma in Chemical Engineering, April 2003
  "Selective oxidation of CO in the presence of excess H_2 over Au/α-Fe_2O_3 catalysts"
  Advisor: Prof. S. Bebelis

Seminars

- "Fuel cells applications in stationary and mobile systems", (46 hours), FORTH/ICE-HT, Patras 2004.
- "Production of hydrogen from conventional fuels and renewable energy sources", (46 hours), University of Patras, Chemical Engineering Department, Patras 2004

Languages

- **English:** First Certificate in English, University of Cambridge (Lower)
- **Italian:** Certificato di conoscenza della lingua Italiana Livello 2, Perugia, (CELI 2)
- **Italian:** Certificato Intermedio di conoscenza della lingua Italiana, (PALSO)

FELLOWSHIPS/AWARDS/DISTINCTIONS/INVITED LECTURES

- **2002-2003** Under-graduate Fellow of FORTH/ICE-HT, Patras, Greece
- **2003-2008** Post-graduate Fellow of FORTH/ICE-HT, Patras, Greece
- **2004** The paper No. 1 (Catal. Commun. 5 (2004) 231-235) was featured in the ScienceDirect **TOP25 Hottest Articles** (2004) within Catalysis Communications; **Fourth most cited article** among the research articles published in Catal. Commun. in 2004.
- **2005** The paper No. 2 (Catal. Commun. 6 (2005) 497-501) was featured in the ScienceDirect **TOP25 Hottest Articles** (2005) within Catalysis Communications
- **2006** The paper No. 3 (Appl. Catal. B: Environ. 66 (2006) 168-174) was featured in the ScienceDirect **TOP25 Hottest Articles** (2006) within Applied Catalysis B
- **2006** The paper No. 5 (Chem. Eng. J. 124 (2006) 41-45) was featured in the ScienceDirect **TOP25 Hottest Articles** (2006) within Chemical Engineering Journal
- **2007** The paper No. 7 (Chem. Eng. J. 134 (2007) 16-22) was featured in the ScienceDirect **TOP25 Hottest Articles** (2007) within Chemical Engineering Journal
- **2008** The paper No. 10 (J. Catal. 256 (2008) 237-247) was featured in the ScienceDirect **TOP25 Hottest Articles** (2008) within Journal of Catalysis
- **2008** The paper No. 12 (Catal. Today 138 (2008) 239-243) was featured in the ScienceDirect **TOP25Hottest Articles** (2009) within Catalysis Today
- **2009-2010** **Post-Doctoral Fellow of National Fellowships Foundation**, Patras, Greece
- **September 2014** **Best poster award** for the work: "Pt/TiO_2 and Pt/CeO_2 nanostructured materials for fuel cell applications" presented at the 30th Panhellenic Conference on Solid-State Physics and Materials Science, Heraklion, Crete, Greece, September 21-24, 2014.
- **June 2022** Award for **best oral presentation** for the work: "Biochars from reed straws for sodium ion batteries" presented in the 13th Panhellenic Conference on Chemical Engineering, Patras, Greece, June 2-4, 2022.

- **June 2022** "Naturally-derived materials for energy storage devices", **Invited lecture**, Faculty of Chemistry, University of Maria Curie Sklodowska (UMCS), Lublin, Poland, June 22nd, 2022.
- **March 2023** "Biochars for energy storage devices", **Invited lecture**, Department of Chemistry, University of Cyprus, Nicosia, Cyprus, March 1st, 2023

PRESENT EMPLOYMENT/OCCUPATION

- **2008-2010** **Assistant Professor (fixed term)**, Department of Agricultural Products Technology, School of Agricultural Technology, Technological Educational Institution of Kalamata (currently: University of Peloponnese), Greece
- **2016, 2019, 2021, 2022, 2023** **Lecturer (fixed term)**, Department of Materials Science, University of Patras, Greece
- **2017-2019** **Lecturer (fixed term, Academic Experience)**, Department of Materials Science, University of Patras, Greece
- **2017-2018 2019-2020** **Lecturer (fixed term)**, Department of Chemical Engineering, University of Patras, Greece
- **2008-now** **Postdoctoral researcher** of FORTH/ICE-HT, Lab of Heterogeneous Catalysis, Patras, Greece
- **2020-2021** **Postdoctoral researcher** of Chemical Engineering Department, Lab of Chemical & Electrochemical Processes, University of Patras, Greece
- **2021-2023** **Postdoctoral researcher** of Materials Science Department, Lab of Nanomaterials & Energy Technologies, University of Patras, Greece
- **2023-today** **Assistant Professor** in the field of: "Processes and systems of electrochemical engineering for energy applications", Department of Chemical Engineering, University of Patras, Greece

Visiting researcher

11/2007: Institute of Catalysis, Bulgarian Academy of Sciences, Sofia Bulgaria (Prof. Tabakova research group)

06/2013: Fraunhofer ICT-IMM, Mainz, Germany (Prof. Kolb research group)

07/2015: Functional Nanomaterials Center, Faculty of Chemistry, University of Maria Curie Sklodowska, Lublin, Poland (Prof. Machocki research group)

05/2018: Functional Nanomaterials Center, Faculty of Chemistry, University of Maria Curie Sklodowska, Lublin, Poland (Prof. Machocki & Prof. Gac research group)

05/2019,
06/2022,
06/2023,
10/2023: Functional Nanomaterials Center, Faculty of Chemistry, University of Maria Curie Sklodowska, Lublin, Poland (Prof. Gac research group)

Teaching Experience

Undergraduate Programs

- "**Analytical Chemistry Laboratory**", (teaching assistant), core course of 1st year, Chemical Engineering Department, University of Patras (2003/2004), Lecturer (fixed term) (2017/2018).
- "**Organic Chemistry Laboratory**", (teaching assistant), core course of 2nd year, Chemical Engineering Department, University of Patras (2004/2005, 2005/2006).
- "**Polymers Laboratory**", (teaching assistant), core course of 3rd year, Chemical Engineering Department, University of Patras (2004/2005).
- "**Engineering principles, physical processing of vegetative products**" core course of 3rd year, Department of Agricultural Products Technology, School of Agricultural Technology, Technological Educational Institution of Kalamata (2008/2009, 2009/2010).
- "**General and Inorganic Chemistry**" core course of 1st year, Department of Agricultural Products Technology, School of Agricultural Technology, Technological Educational Institution of Kalamata (winter semester 2010/2011).
- "**Chemistry Laboratory II**", core course of 1st year, Department of Materials Science, University of Patras (spring semesters 2016/2017, 2019/2020, 2020/2021, 2021/2022, 2022/2023).
- "**Materials & Environment**" elective course of 3rd year, Department of Materials Science, University of Patras (spring semester 2017/2018 & fall semester 2018/2019).
- "**Materials for catalytic processes**" elective course of 3rd year, Department of Materials Science, University of Patras (spring semester 2018/2019).
- "**Physical Chemistry Laboratory**", core course of 3rd year, Department of Materials Science, University of Patras (winter semester 2019/2020).
- "**Chemical Engineering Processes Laboratory I**", core course of 4th year, Department of Chemical Engineering, University of Patras (winter semester 2019/2020).

- "**Materials Science Laboratory III**", core course of 2nd year, Department of Materials Science, University of Patras (spring semesters 2020/2021, 2021/2022).

Postgraduate Programs

- "**Introduction to nanomaterials and heterogeneous catalysis - synthesis, characterization and applications for energy and environmental friendly processes**", (Erasmus+ staff mobility for teaching assignment), Department of Chemistry, University of Maria Curie-Sklodowska, Lublin, Poland (May 2019).
- "**Nanomaterials and devices for energy storage applications (fuel cells, supercapacitors, batteries)**", (Erasmus+ staff mobility for teaching assignment), Department of Chemistry, University of Maria Curie-Sklodowska, Lublin, Poland (June 2022).
- "**Energy storage devices (batteries and supercapacitors)**", (Erasmus+ staff mobility for teaching assignment), Department of Chemistry, University of Maria Curie-Sklodowska, Lublin, Poland (June 2023).

Supervising experience

- Co-Supervisor of several research diploma thesis (>10)
- Co-Supervisor of the Master Diploma Thesis of Alexandra Paxinou, "Development of Pt/CeO_2 and Pt/TiO_2 nanostructured catalysts for the production of hydrogen from methanol", Department of Materials Science, University of Patras, 2015.
- Co-Supervisor of the Master Diploma Thesis of Konstantinos Kappis, "Effect of the synthesis parameters of hydrothermal method on the catalytic properties of nanoceria", Department of Materials Science, University of Patras, 2018.
- Co-Supervisor of the PhD Thesis of Pinelopi Angelopoulou, "Development of anodic and cathodic nanostructured materials for lithium batteries applications", Department of Materials Science, University of Patras, (2016-2020, Date of defense: March 2020).
- Co-Supervisor of the PhD Thesis of Christos Papadopoulos, "Tuning the physicochemical properties of nanostructured copper-cerium catalysts via a hydrothermal method", Department of Materials Science, University of Patras, (2020-2023, Date of defense: May 2023).
- Co-Supervisor of the MSc Thesis of Maria Mpiliou, "Physicochemical Properties of Natural Iron Oxides (Fe_2O_3, Fe_3O_4, $Fe^{2+}Fe^{3+}{}_2O_4$) for the oxidation of CO", Department of Materials Science, Interdisciplinary Postgraduate Program on "Environmental Sciences", University of Patras, 2023.

- Co-Supervisor of the PhD Thesis of Konstantinos Kappis, "Development of catalytic methanol processors for application in high temperature fuel cells", Department of Materials Science, University of Patras (2020-2023, Date of defense: September 2023).
- Co-Supervisor of the PhD Thesis of Konstantinos Papageorgiou, "Functional CuZn catalysts for the low temperature production of hydrogen via steam reforming of methanol", Department of Materials Science, University of Patras (ongoing).
- Co-Supervisor of the MSc Thesis of Dimitra Katsoulotou, "Production of biochars for anode electrodes in sodium-ion batteries", Department of Chemistry, University of Patras (ongoing).

PROFESSIONAL SOCIETIES AND ACTIVITIES

- Technical Chamber of Greece
- Association of Greek Chemical Engineers
- Hellenic Catalysis Society
- **Reviewer in Peer Reviewed Journals:** Applied Catalysis B: Environmental, International Journal of Hydrogen Energy, Materials, Energy Science & Engineering, Diamond & Related Materials, Ingeniería e Investigación Journal, Processes, Nanomaterials, Inorganics, Energies, ChemEngineering, Materials, Colloids and Surfaces A: Physicochemical and Engineering Aspects.
- **Guest Editor of a Special Issue in the journal Catalysts.** The special issue is focused on "Ceria-Based Nanocatalysts for Environmental and Energy Applications".
- **Member** of the Scientific Committee, 16th Panhellenic Catalysis Symposium, Chania, Greece, 2022.
- **Session Chair**, European Hydrogen Energy Conference (EHEC2022), Madrid, Spain, 2022.

RESEARCH ACTIVITY

- ***Nanomaterials: Synthesis and characterization***

  Synthesis of wide range of materials for energy and environmental applications; nanostructured oxide catalysts (ceria, titania, zinc oxides, iron oxides, $CuCeO_x$, $CuMnO_x$ spinels etc.); Precious metal-based catalysts (i.e. gold and platinum based catalysts supported on ceria, titania, alumina, carbons etc.); LiMn-based spinels and naturally-derived carbons (biochars) for Li- and Na-ion battery electrodes, and supercapacitors; Mineral-based materials for energy and environmental applications. Conventional chemical methods (impregnation, coprecipitation, sol-gel) and development of non-conventional easily tuned and scaled-up synthesis methods (hydrothermal, combustion). Synthesis of monolithic structures (ceramic, metallic, foams, carbon paper, cordierites etc). Materials characterization via wide range of analytical and spectroscopic techniques (ex-situ and in-situ) including atomic adsorption spectroscopy (AAS), N_2 porosimetry, X-ray powder diffraction (XRD), electron microscopy (S/TEM), X-ray photoelectron spectroscopy (XPS), thermogravimetric analysis (TGA), electrochemical impedance spectroscopy (EIS), cyclic voltammetry (CV), polarization measurements, transient-isotopic methods (SSITKA) and temperature-programmed methods (TPR, TPD, TPSR). (Published papers 1-45).

- ***Catalytic processes for the production and purification of hydrogen for fuel cell applications***: a) Hydrogen production from methanol (steam reforming, decomposition, partial oxidation), b) Water-gas shift reaction, c) Removal of CO from hydrogen reformate gas streams via CO-PrOx (Preferential CO Oxidation) process; (Published papers 1-14, 16, 18, 19, 21-26, 28, 29, 34, 35, 37, 39, 40, 42, 44).
- ***Environmental catalysis for air pollution control***: Catalytic oxidation of CO; (Published papers 30, 33).
- ***Internal Reforming Methanol Fuel Cells***: Incorporation of a methanol reformer into the anodic compartment (bi-functional anode) of a high-temperature, polymer electrolyte fuel cell (HT-PEMFC), so that methanol reforming takes place inside the fuel cell stack (internal reforming); (Published papers 15, 17, 19, 20, 22, 27, 37, 38, 40, 42, 44).
- ***Energy storage.*** Electrodes and devices; Naturally derived carbons (biochars), silicon, graphenes, LiMn spinels as electrodes for energy storage devices (lithium and sodium batteries, supercapacitors). (Published papers 31, 32, 36, 45).

RESEARCH PROJECTS

Participation in several research projects financed either by the Greek Ministry of Development or EC:

Finished

- "Development of a Portable Internal Reforming Methanol High Temperature PEM Fuel Cell System, IRMFC", **FCH JU project**, 2013-2016.
- "Hybrid Membrane-pressure Swing Absorption (PSA) Hydrogen purification Systems, HY2SEPS2", **FCH JU project**, 2011-2013.
- "Development of an Internal Reforming Alcohol High Temperature PEM Fuel Cell Stack, IRAFC", **FCH JU project**, 2010-2013.
- "H_2 from bio-alcohols: An efficient route for hydrogen production via novel reforming catalysts", **ACENET project** (Applied Catalysis European Network), 2009-2011.
- "An electrical energy production system with fuel cells and methanol fuel", **GSRT (EPAN) project**, 2003-2007.
- "Innovative catalysts for the production and purification of hydrogen with application in fuel cells", **Greece-Bulgaria bilateral research project**, 2005-2007.
- "Development of carbon based materials for supercapacitors", **ARCHERS project** funded by Stavros Niarchos Foundation, 2018-2019.
- "Innovative Catalytic System for Purification of exhaust gases from a Formaldehyde synthesis unit", **ForCat project (senior researcher)**; Research-Create-Innovate, Call A (funded by GSRT); 2018-2022.
- "Scale up of Electrochemically Promoted Catalytic Hydrogenation of CO_2 for fuel production", **CO_2 TO FUELS project (senior researcher)**; Research-Create-Innovate, Call A (funded by GSRT); 2018-2022.
- "Development of Sodium-ion batteries based on naturally derived anode materials", **BaNaNa project (senior researcher)**; Research-Create-Innovate, Call B; total budget: 998,280€ (906,624€ funded by GSRT); 2020-2023.

Running

- "Tuning the prOPerties of CuZn-based nanostructured CATalysts for fuel cell applications", **TOPCAT project (Scientific Coordinator)**; total budget: 190,000€; funded by HFRI (2nd Call for PostDocs); Duration: 36 months; 2021-now.

PUBLICATIONS/PRESENTATIONS

- **Publications in peer-reviewed international journals: 45**
- **Citations (Scopus, November 2023): 1802**
- **h index (Scopus, November 2023): 22**
- **Presentations-publications in international conferences: 49**
- **Presentations-publications in national conferences: 39**
- **Patents: 1**

PUBLICATIONS IN PEER-REVIEWED INTERNATIONAL JOURNALS

1. **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, "Production of hydrogen via combined steam reforming of methanol over CuO-CeO_2 catalysts"
   Catal. Commun. 5 (2004) 231-235.
   Impact factor: 3.7, Times cited: 101
   Featured on the ScienceDirect TOP25 Hottest Articles (2004) within Catal. Commun. Fourth most cited article among the research articles published in Catal. Commun. in 2004.

2. **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, "Steam reforming of methanol over copper-manganese spinel oxide catalysts"
   Catal. Commun. 6 (2005) 497-501.
   Impact factor: 3.7, Times cited: 101
   Featured on the ScienceDirect TOP25 Hottest Articles (2005) within Catal. Commun.

3. **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, "In-situ combustion synthesis of structured Cu-Ce-O and Cu-Mn-O catalysts for the production and purification of hydrogen"
   Appl. Catal. B: Environ. 66 (2006) 168-174.
   Impact factor: 22.1, Times cited: 103
   Featured on the ScienceDirect TOP25 Hottest Articles (2006) within Appl. Catal. B.

4. **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, "Effect of dopants on the performance of CuO-CeO_2 catalysts in methanol steam reforming"
   Appl. Catal. B: Environ. 69 (2007) 226-234.

Impact factor: 22.1, Times cited: 101

5. G. Avgouropoulos, **J. Papavasiliou**, V. Idakiev, T. Tabakova, T. Ioannides, "A comparative study of ceria-supported gold and copper oxide catalysts for preferential CO oxidation reaction"
   Chem. Eng. J. 124 (2006) 41-45.
   Impact factor: 15.1, Times cited: 100
   Featured on the ScienceDirect TOP25 Hottest Articles (2006) within Chem. Eng. J.

6. T. Tabakova, V. Idakiev, **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, "Effect of additives on the WGS activity of combustion synthesized CuO/CeO_2 catalysts"
   Catal. Commun. 8 (2007) 101-106.
   Impact factor: 3.7, Times cited: 85

7. P. Panagiotopoulou, **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, D.I. Kondarides, "Water-gas shift activity of doped Pt/CeO_2 catalysts"
   Chem. Eng. J. 134 (2007) 16-22.
   Impact factor: 15.1, Times cited: 141
   Featured on the ScienceDirect TOP25 Hottest Articles (2007) within Chem. Eng. J.

8. **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, "Combined steam reforming of methanol over Cu-Mn spinel oxide catalysts"
   J. Catal. 251 (2007) 7-20.
   Impact factor: 7.3, Times cited: 183

9. G. Avgouropoulos, **J. Papavasiliou**, T. Ioannides, "PROX reaction over $CuO-CeO_2$ catalyst with reformate gas containing methanol"
   Catal. Commun. 9 (2008) 1656-1660.
   Impact factor: 3.7, Times cited: 24

10. G. Avgouropoulos, M. Manzoli, F. Boccuzzi, T. Tabakova, **J. Papavasiliou**, T. Ioannides, V. Idakiev, "Catalytic performance and characterization of Au/doped-ceria catalysts for the preferential CO oxidation reaction"
    J. Catal. 256 (2008) 237-247.
    Impact factor: 7.3, Times cited: 139
    Featured on the ScienceDirect TOP25 Hottest Articles (2008) within J. Cat.

11. T. Tabakova, V. Idakiev, **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, "Impact of the preparation method on the water-gas shift activity of CuO/doped-ceria catalysts" Bulg. Chem. Commun. 40 (2008) 42-47.
    Impact factor: 0.640, Times cited: 1

12. M. Manzoli, G. Avgouropoulos, T. Tabakova, **J. Papavasiliou**, T. Ioannides, F. Boccuzzi, "Preferential CO oxidation in H_2-rich gas mixtures over Au/doped ceria catalysts" *Catal. Today* 138 (2008) 239-243.
    Impact factor: 5.3, Times cited: 62
    Featured on the ScienceDirect TOP25 Hottest Articles (2009) within Catal. Today.

13. **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, "Steady-state isotopic transient kinetic analysis of steam reforming of methanol over Cu-based catalysts" *Appl. Catal. B: Environ.*, 88 (2009) 490-496.
    Impact factor: 22.19, Times cited: 54

14. G. Avgouropoulos, **J. Papavasiliou**, T. Ioannides, "Hydrogen production from methanol over combustion-synthesized noble metal/ceria catalysts" *Chem. Eng. J.* 154 (2009) 274-280.
    Impact factor: 15.1, Times cited: 41

15. G. Avgouropoulos, **J. Papavasiliou**, M. Daletou, T. Ioannides, J. Kallitsis, S. Neophytides, "Reforming methanol to electricity in a high temperature PEM fuel cell" *Appl. Catal. B: Environ.* 90 (2009) 628-632.
    Impact factor: 22.1, Times cited: 49

16. T. Tabakova, G. Avgouropoulos, **J. Papavasiliou**, M. Manzoli, F. Boccuzzi, K. Tenchev, F. Vindigni, T. Ioannides, "CO-free hydrogen production over $Au/CeO_2–Fe_2O_3$ catalysts: Part 1. Impact of the support composition on the performance for the preferential CO oxidation reaction" *Appl. Catal. B: Environ.* 101 (2011) 256-265.
    Impact factor: 22.1, Times cited: 89

17. **J. Papavasiliou**, G. Avgouropoulos, T. Ioannides, "CuMnOx catalysts for internal reforming methanol fuel cells: Application aspects" *Int. J. Hydrogen Energy* 37 (2012) 16739-16747.

Impact factor: 7.2, Times cited: 22

18. T. Tabakova, V. Idakiev, G. Avgouropoulos, **J. Papavasiliou**, M. Manzoli, F. Boccuzzi, T. Ioannides, "Highly active copper catalyst for low-temperature water-gas shift reaction prepared via a Cu-Mn spinel oxide precursor"
    Appl. Catal. A: Gen. 451 (2013) 184-191.
    Impact factor: 5.5, Times cited: 50

19. G. Avgouropoulos, **J. Papavasiliou**, T. Ioannides, S. Neophytides "Insights on the effective incorporation of a foam-based methanol reformer in a high temperature polymer electrolyte membrane fuel cell"
    J. Power Sources 296 (2015) 335-343.
    Impact factor: 9.2, Times cited: 21

20. G. Avgouropoulos, S. Schlicker, K.-P. Schelhaas, **J. Papavasiliou**, K. Papadimitriou, E. Theodorakopoulou, N. Gourdoupi, A. Machocki, T. Ioannides, J. Kallitsis, G. Kolb, S. Neophytides "Performance evaluation of a proof-of-concept 70 W internal reforming methanol fuel cell system"
    J. Power Sources 307 (2016) 875-882.
    Impact factor: 9.2, Times cited: 29

21. A.E. Giannakas, M. Antonopoulou, **J. Papavasiliou**, Y. Deligiannakis, I. Konstantinou "Photocatalytic performance of Pt-TiO_2, Pt-N-TiO_2 and Pt-N/F-TiO_2 towards simultaneous Cr(VI) reduction/benzoic acid oxidation: Insights into photogenerated charge carrier dynamics and catalyst properties"
    J. Photochem. Photobiol. A: Chem. 349 (2017) 25-35.
    Impact factor: 4.3, Times cited: 22

22. **J. Papavasiliou***, G. Słowik, G. Avgouropoulos, "Redox behavior of a copper-based methanol reformer for Fuel Cell applications"
    Energy Technol. 6 (2018) 1332-1341.
    Impact factor: 3.8, Times cited: 8

23. **J. Papavasiliou**, M. Rawski, J. Vakros, G. Avgouropoulos, "A Novel Post-Synthesis Modification of CuO-CeO_2 catalysts: Effect on Their Activity for Selective CO Oxidation"
    ChemCatChem 10 (2018) 2096-2106.

Impact factor: 4.5, Times cited: 32

24. E. Topoglidis, P.-A. Kolozoff, Ch. Tiflidis, **J. Papavasiliou**, E. Sakellis "Adsorption and electrochemical behaviour of Cyt-c on Carbon Nanotubes/TiO_2 nanocomposite films fabricated at various annealing temperatures"
Colloid. Polym. Sci. 296 (2018) 1353-1364.
Impact factor: 2.4, Times cited: 2

25. **J. Papavasiliou**, J. Vakros, G. Avgouropoulos "Impact of acid treatment of CuO-CeO_2 catalysts on the preferential oxidation of CO reaction"
Catal. Commun. 115 (2018) 68-72.
Impact factor: 3.7, Times cited: 14

26. **J. Papavasiliou**, A. Paxinou, G. Słowik, S. Neophytides, G. Avgouropoulos "Steam reforming of methanol over nanostructured Pt/TiO_2 and Pt/CeO_2 for fuel cell applications"
Catalysts 8 (2018) 544.
Impact factor: 3.9, Times cited: 20

27. **J. Papavasiliou**, C. Schütt, G. Kolb, S. Neophytides, G. Avgouropoulos "Technological aspects of an auxiliary power unit with internal reforming methanol fuel cell"
Int. J. Hydrogen Energy, 44 (2019) 12818-12828.
Impact factor: 7.2, Times cited: 8

28. K. Kappis, C. Papadopoulos, **J. Papavasiliou**, J. Vakros, Y. Georgiou, Y. Deligiannakis, G. Avgouropoulos, "Tuning the catalytic properties of Copper-Promoted Nanoceria via a hydrothermal route"
Catalysts 9 (2019) 138.
Impact factor: 3.9, Times cited: 19

29. W. Gac, W. Zawadzki, M. Greluk, G. Słowik, A. Machocki, **J. Papavasiliou**, G. Avgouropoulos, "Investigation of the Inhibiting Role of Hydrogen in the Steam Reforming of Methanol"
ChemCatChem 11 (2019) 3264-3278.
Impact factor: 4.5, Times cited: 6

30. K. Kappis, **J. Papavasiliou***, "Influence of the Hydrothermal Parameters on the Physicochemical Characteristics of Cu−Ce Oxide Nanostructures Copper-promoted ceria catalysts for CO oxidation reaction"
    ChemCatChem 11 (2019) 4765-4776.
    Impact factor: 4.5, Times cited: 6

31. K. Vrettos, P. Angelopoulou, **J. Papavasiliou**, G. Avgouropoulos, V. Georgakilas, "Sulfur-doped graphene aerogels reinforced with carbon fibers as electrode materials"
    J. Mater. Sci. 55 (2020) 9676-9685.
    Impact factor: 4.5, Times cited: 6

32. O.S. Taskin, N. Yuka, **J. Papavasiliou**, G. Avgouropoulos, "Interconnected conductive gel binder for high capacity silicon anode for Li-ion batteries"
    Mater. Let. 273 (2020) 127918.
    Impact factor: 3.0, Times cited: 8

33. C. Papadopoulos, K. Kappis, **J. Papavasiliou**, J. Vakros, M. Kuśmierz, W. Gac, Y. Georgiou, Y. Deligiannakis, G. Avgouropoulos, "Copper-promoted ceria catalysts for CO oxidation reaction"
    Catal. Today 355 (2020), 647-653.
    Impact factor: 5.3, Times cited: 15

34. **J. Papavasiliou***, "Interaction of atomically dispersed gold with hydrothermally prepared copper-cerium oxide for preferential CO oxidation reaction"
    Catal. Today 357 (2020) 684-693.
    Impact factor: 5.3, Times cited: 8

35. Y. Deligiannakis, V. Tsikourkitoudi, P. Stathi, K. Wegner, **J. Papavasiliou**, M. Louloudi, "$PdO/Pd^0/TiO_2$ Nanocatalysts Engineered by Flame Spray Pyrolysis: Study of the Synergy of PdO/Pd^0 on H_2 Production by HCOOH Dehydrogenation and the Deactivation Mechanism"
    Energy & Fuels 34 (2020) 15026-15038.
    Impact factor: 5.3, Times cited: 8

36. P. Angelopoulou, S. Kassavetis, **J. Papavasiliou**, D. Karfaridis, G. Słowik, P. Patsalas, G. Avgouropoulos, "Enhanced Performance of $LiAl_{0.1}Mn_{1.9}O_4$ Cathode for Li-Ion Battery via TiN Coating"
    Energies 14 (2021) 825.

Impact factor: 3.004, Times cited: 6

37. K. Kappis, **J. Papavasiliou***, G. Avgouropoulos, "Methanol Reforming Processes for Fuel Cell Applications"
Energies 14 (2021) 8442.
Impact factor: 3.2, Times cited: 3

38. Z. Fu, Y. Li, **J. Papavasiliou**, Y. Xing, L. Liu, Z. Li, L. Chen, H. Li, "Performance of CCM-type MEAs based on a $CsH_5(PO_4)_2$-doped PBI membrane for HT-PEMFC"
International Journal of Energy Research 46 (2022) 24148-24157
Impact factor: 4.672

39. C. Papadopoulos, K. Kappis, **J. Papavasiliou***, J. Vakros, A. Antonelou, W. Gac, H. Li, G. Avgouropoulos, "Impact of Hydrothermally Prepared Support on the Catalytic Properties of CuCe Oxide for Preferential CO Oxidation Reaction"
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Patents

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PhD Thesis abstract

❖ **Joan Papavasiliou**

Thesis: "Production of hydrogen via methanol reforming over copper oxide catalysts"

The increasing demand for energy, the uncertainty in energy prices and the environmental impact of the conversion of fossil fuels to energy, are three of the factors that lead in the development of energy conversion processes which are efficient, sustainable and have minimal environmental impact. Fuel cells seem to be a promising solution, as they are both environmentally clean and highly efficient. The ideal fuel for fuel cells is hydrogen which can be produced from hydrocarbon reforming. Methanol is the leading candidate as hydrogen carrier, due to its high energy density, easy availability and safe handling/storage, relatively low reforming temperatures and low formation of CO.

In the present thesis, the catalytic properties of three different copper based systems: $CuO\text{-}CeO_2$, modified $CuO\text{-}CeO_2$ and Cu-Mn-O, were investigated for (combined) steam reforming of methanol (CSRM, SRM). Additionally, the performance of $CuO\text{-}CeO_2$ and Cu-Mn-O oxide catalysts supported on Al metal foam was examined for the same process. All catalysts were prepared via the combustion method. The physicochemical characteristics of all samples were investigated, along with catalytic activity and CO selectivity. Furthermore, the SSITKA technique was applied in selected samples, in order to obtain information about the mechanism of the steam reforming of methanol.

The crystallite size of CeO_2 as well as the specific surface area of $CuO\text{-}CeO_2$ catalysts, were strongly influenced by the parameters of the synthesis and specifically by the autoignition time. These results are in good agreement with the catalytic behavior for methanol reforming. Such catalysts are active for both SRM and CSRM reactions. The optimal catalyst was prepared with Cu/(Cu+Ce) ratio equal to 0.15. The higher methanol conversion in the case of CSRM may be attributed to more efficient heat transfer in the bed, as heat is produced in-situ from combustion of part of methanol feed.

In the case of doped $CuO\text{-}CeO_2$ catalysts, at least part of dopant cations gets incorporated into the CeO_2 lattice leading to solid solution formation. As a result, the physicochemical characteristics of the samples, such as: CeO_2 lattice parameter, specific surface area and reducibility, were influenced. Concerning catalytic activity of the modified $CuO\text{-}CeO_2$ catalysts, it was found that small amounts of oxides of Sm and Zn enhance the catalytic activity of $CuO\text{-}CeO_2$, while the addition of oxides of La, Zr, Mg, Gd, Y or Ca lowers or has negligible effect on catalytic activity. Further addition of dopant always leads to a decrease of

catalyst activity. Pd and Rh-containing catalysts have similar (Rh) or higher (Pd) activity compared to $CuO\text{-}CeO_2$, but the CO selectivity is also significantly higher.

Cu-Mn spinel oxide catalysts are highly active for the production of H_2 via (combined) steam reforming of methanol despite their low surface area. Their activity is comparable to that of commercial Cu-Zn-Al catalysts. XRD analysis of fresh catalysts revealed that they are composed of the spinel phase $Cu_{1.5}Mn_{1.5}O_4$, as well as of Mn_2O_3 and CuO depending on the Cu/Mn ratio. XPS analysis revealed the presence of two different oxidation states of both copper (Cu^{2+} and Cu^{1+}) and manganese (Mn^{4+} and Mn^{3+}) in fresh catalysts and decomposition of the spinel in used catalysts. The optimal catalyst was prepared with a Cu/(Cu+Mn) ratio equal to 0.30. A simple power-law rate expression with reaction orders of 0.7 (methanol) and 0.5 (water) provides a good fitting of the kinetic data. Product hydrogen, on the other hand, inhibits the reaction.

SSITKA technique was applied in three different copper based catalysts, i.e. the optimal $Cu_{0.15}Ce_{0.85}$ and $Cu_{0.30}Mn_{0.70}$ samples and a commercial $Cu/ZnO/Al_2O_3$ catalyst, in order to determine the “carbon path” and “oxygen path” of the steam reforming of methanol. Based on the findings of the isotopic study, a mechanism has been proposed for the reforming reaction over Cu-Mn-O, in which methyl formate is formed as a reaction intermediate. Over Cu-Ce-O and $Cu/ZnO/Al_2O_3$ catalysts, another reaction mechanism is taking place along with the previous mentioned one, resulting in the intermediate dioxomethylene.

The combustion method was found to be a simple and fast route for the in-situ synthesis of $CuO\text{-}CeO_2$ and Cu-Mn spinel oxide catalysts supported on Al metal foam. Foam catalysts exhibited similar structural properties compared to catalysts in powder form. The adhesion of the catalytic layer to the metal foam surface was good. Compared to unsupported catalysts used in powder form, the performance of these catalytic systems deposited on metallic foam via the in-situ combustion method exhibited similar catalytic performance, in the reactions of methanol reforming and selective CO oxidation, remaining very active and remarkably selective.