

## **Alexandros Kalarakis, Assistant Professor, Department of Mechanical Engineering, UoP**

### **1. Education**

- 2003: Ph.D., Two-phase flow simulation, including wetting phenomena and phase changes using a new method of cellular automata, Chemical Engineering Dept., Faculty of Engineering, University of Patras
- 2001: M.D., Simulation, optimization and process control, Chemical Engineering Dept., Faculty of Engineering, University of Patras
- 1996: B.Sc. in Physics, Faculty of Science, UPatras

### **2. Research Activity and Work Experience**

- Sep 2019-present: Assistant Professor, Mechanical Engineering Dept., UOP
- Apr 2014-Sep 2019: Lecturer, Mechanical Engineering Department, TEI-WG
- 2003-2014: Postdoctoral Research Fellow, ICEHT/FORTH
- 2004-2017: Adjunct Lecturer/Assistant Professor, Chemical Engineering Dept., UPATRAS
- 2003-2014: Adjunct Lecturer/Assistant Professor, TEI-WG/TEI\_PATRAS

#### **2.1 Research positions**

- 2021-present: Director of Laboratory for «Analysis of Materials and Structures» (LAMS-UOP)
- 2015-present: Senior Scientist and Operator of the Scanning Electron Microscopy (SEM) unit (UOP)
- 2003-present: Research Team Member: Simulation and Design of Processes and Materials (ICE-HT)

#### **2.2 Research interests**

Theoretical and experimental modeling and computer simulation of transport phenomena and in particular the phenomena that govern interfaces in natural processes, material modeling. Characterization of nanostructured materials with techniques such as Microscopy (Scanning Electron Microscopy - SEM), Spectroscopy (X-ray Diffraction - XRD) and optical profilometry.

#### **2.3 Participation in research projects:**

- Research Project entitled «Advanced high-performance thermal insulation cement mortar» (4/01/2021 - 28/04/2023)
- Research project entitled «Simulation of particle flow» (1/11/2015-31/12/2015)
- Research project entitled «Modeling of structure and transport phenomena in fuel cells» (01/04/2015 - 30/06/2015)
- Research project entitled «Particle interactions and separations using two-phase models» (1/10/2014 - 31/12/2014)
- Research Project Archimedes III entitled «Mathematical and Computational Fluid Field Investigation of Biological Fluids for Therapeutic Design in Clinically Important Conditions» (15/02/2013-31/10/2015).
- Research Project Archimedes III entitled «Two-phase flow in porous media: Improvement of the DeProf mechanistic model and its application to solving problems of practical interest» (01/04/2013 - 30/06/2015).
- Research project EURECA entitled «Efficient use of Resources in Energy Converting Applications» (1/1/2013 - 30/06/2014)
- Research project NANOBARRIER entitled «NanoBarrier-Extended shelf-life biopolymers for sustainable and multifunctional food packaging solutions» (1/7/2012 - 31/12/2012)
- Research project C2CA entitled «Advanced Technologies for the Production of Cement and Clean Aggregates from Construction and Demolition Waste» (1/1/2011 – 30/6/2012)
- Research project BIONEXGEN entitled «Development of next generation bioreactor systems» (1/10/2010 - 31/12/2010)
- Research project NANOMEMPRO entitled «Expanding membrane macroscale applications by exploring nanoscale material properties» (1/3/2008 - 31/8/2008 and 16/12/2008 - 28/2/2009)

- Research project AKMΩN-61 entitled «Design and study of heterogeneous materials for applications in energy and environmental technologies» (1/1/2007 - 30/11/2007)
- Research project EPSON/S-4 entitled «Evaporation on a patterned substrate» (1/7/2005 - 31/12/2006)
- Research project EPSON/S-3 entitled «J. D. A. Substrate» (1/2/2003 - 31/3/2005)
- Research project IP-1 (1/1/2002-30/6/2002)
- Research project EOK/EN-4 entitled «Ground water risk assessment at contaminated sites» (1/10/2000-31/12/2001)

### 3. Teaching Experience

2004-present: Teaching experience in Physics, Numerical Methods, Hydraulics, Programming for Engineers, Heat Transfer, Simulation of Transport Phenomena, Fluid Mechanics, Thermodynamics, Materials, Electrical Engineering, Electronics, Automatic Control Systems.

### 4. Reviewer

APS Physical Review Journals (Physical Review Letters, Physical Review X, Reviews of Modern Physics, Physical Review A, Physical Review B, Physical Review C, Physical Review D, Physical Review E, Physical Review Applied, Physical Review Fluids, Physical Review Accelerators and Beams, Physical Review Physics Education Research, Physical Review, Physical Review (Series I), Physics)

(Referee Number: 860284 Dr. Alexandros Kalarakis)

Elsevier Editorial System (Reviewer: Alexander Kalarakis, Ph.D)

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### 5. Patents

Robotic femoral-leg guardian (O.B.I.:1009888/18-12-2020)

### 6. Publications

His published work consists of 72 publications, in international scientific journals (31), in international (24) and national conferences (17) and in book chapters (3), recognized with more than 536 references.

h index: 14 (Google Scholar), 13 (Scopus), i10 index: 18 (Scholar).

References: 580 (Scholar), 436 (Scopus), 415 (exclude self-citations, Scopus).

### 7. Selected Publications

1. A.N. Kalarakis, V.N. Burganos and A.C. Payatakes, "Galilean-invariant lattice-Boltzmann simulation of liquid-vapor interface dynamics", *Phys. Rev. E*, 65, 056702 (2002)
2. A.N. Kalarakis, V.N. Burganos and A.C. Payatakes, "Three-dimensional lattice-Boltzmann model of van der Waals fluids", *Phys. Rev. E*, 67, 016702 (2003)
3. V. K. Michalis, A.N. Kalarakis, E. D. Skouras and V.N. Burganos, "Mesoscopic modeling of flow and dispersion phenomena in fractured solids", *Computers Math. Applic.*, 55, 1525-1540 (2008).
4. V. K. Michalis, A.N. Kalarakis, E. D. Skouras and V.N. Burganos, "Mixing within fracture intersections during colloidal suspension flow", *Water Resour. Res.*, 45, W08429 (2009)
5. A.J. Petsi, A.N. Kalarakis and V.N. Burganos, "Deposition of Brownian particles during evaporation of two-dimensional sessile droplets", *Chem. Eng. Sc.*, 65, 2978-2989 (2010)
6. V. K. Michalis, A.N. Kalarakis, E. D. Skouras and V.N. Burganos, "Rarefaction Effects on Gas Viscosity in the Knudsen Transition Regime", *Microfluid Nanofluid*, 9, 847-853 (2010) (DOI 10.1007/s10404-010-0606-3)
7. J. Petsi, A. N. Kalarakis, E. D. Skouras and V. N. Burganos, «Flow and Colloidal Particle Deposition in the Interior of Evaporating Sessile Droplets» *AIP Conf. Proc.*, Volume 1281, pp. 686-689 (2010); <http://dx.doi.org/10.1063/1.3498571>
8. A. N. Kalarakis, V. K. Michalis, E. D. Skouras, and V. N. Burganos "Mesoscopic simulation of rarefied flow in narrow channels and porous media", *Transport Porous Med.*, 94:385-398 (May 3, 2012);doi:10.1007/s11242-012-0010-4

9. A. N. Kalarakis, G. C. Bourantas, E. D. Skouras, V.C. Loukopoulos, and V. N. Burganos "Lattice-Boltzmann and Meshless Point Collocation Solvers for Fluid Flow and Conjugate Heat Transfer", *Int. J. Numer. Meth. Fl.* **70**:1428–1442 (2012); doi:10.1002/flid.2755; doi:10.1007/s11242-012-0010-4
10. N. P. Karagiannakis, G. C. Bourantas, A. N. Kalarakis, E. D. Skouras, and V. N. Burganos, "Efficiency of the meshless local Petrov-Galerkin method with moving least squares approximation for thermal conduction applications" *AIP Conf. Proc.*, Volume 1558, Pages 2269–2272 (2013) ; <http://dx.doi.org/10.1063/1.4825992>
11. N. P. Karagiannakis, G. C. Bourantas, A. N. Kalarakis, E. D. Skouras, and V. N. Burganos, "Meshless local Petrov-Galerkin method with moving least squares approximation for transient thermal conduction applications with variable conductivity" *AIP Conf. Proc.* 1648 , 030009 (2015); <http://dx.doi.org/10.1063/1.4912326>
12. D. Panagiotaras, D. Koulougliotis, D. Nikolopoulos, A. N. Kalarakis, A. Ch. Yiannopoulos and K. Pikiotis, "Biogeochemical Cycling of Nutrients and Thermodynamic Aspects", *Thermodynamics & Catalysis*, 6(2); 1000144 (2015); <http://dx.doi.org/10.4172/2157-7544.1000144>
13. N. P. Karagiannakis, G. C. Bourantas, A. N. Kalarakis, E. D. Skouras, and V. N. Burganos, "Transient Thermal Conduction with Variable Conductivity using the Meshless Local Petrov-Galerkin Method Applied Mathematics and Computation" *Applied Mathematics and Computation*, 272(3), Pages 676–686 (2016); doi:10.1016/j.amc.2015.02.084 [JIF 2013: 1.675].
14. A. Apostolopoulou, D. Sygkridou, A. Rapsomanikis, A. N. Kalarakis, E. Stathatos, «Enhanced performance of mesostructured perovskite solar cells in ambient conditions with a composite TiO<sub>2</sub>–In<sub>2</sub>O<sub>3</sub> electron transport layer.», *Solar Energy Materials and Solar Cells*, 166, Pages 100–107 (2017) (doi:10.1016/j.solmat.2017.03.024)
15. S. Mahajan, D. Sygkridou, E. Stathatos, N. Huse, A. Kalarakis, R. Sharma, «Enhancement in the Efficiency of Crystalline Cu<sub>2</sub>ZnSnS<sub>4</sub> Thin Film Solar Cell by using Various Buffer Layers», *Superlattices and Microstructures*, 109, pages 240-248 (2017) (doi: 10.1016/j.spmi.2017.05.009).
16. V. N. Burganos, E. D. Skouras, and A. N. Kalarakis, "An integrated simulator of structure and anisotropic flow in PTFE-impregnated gas diffusion layers" *Journal of Power Sources*, 365, pages 179-189 (2017).
17. S. Mahajan, E. Stathatos, N. Huse, R. Birajadar, A. Kalarakis, R. Sharma, "Low cost Nanostructure Kesterite CZTS Thin Films for Solar Cells Application", *Material Letters* 210, 92–96 (2018).
18. M. Rozman , U. Bren, M. Lukšič, R. Fuchs Godec, G. Bokias, A. N. Kalarakis, E. Stathatos, *Electrochromic cell with hydrogel-stabilized water-based electrolyte using electrodeposition as a fast color changing mechanism*, *Electrochimica Acta* 283 1105-1114 (2018) (doi: <https://doi.org/10.1016/j.electacta.2018.07.052>)
19. Panagiotaras D., Bekiari V., Stathatos E., Papoulis D., Panagopoulos G., Kalarakis A.N., Iliopoulos I., Kourkouta E. and Mavrokota P., "Use of Halloysite-TiO<sub>2</sub> Nanocomposites for the Decomposition of Tebuconazole Fungicide in Water", *Desalination and Water Treatment*, 127, 132-139 (2018) (doi: 10.5004/dwt.2018.22858)
20. Vasiliki E. Vrakatseli, Alexandros N. Kalarakis, Angelos G. Kalampounias, Eleftherios K. Amanatides, Dimitrios S. Mataras, *Glancing angle deposition effect on structure and light-induced wettability of RF-sputtered TiO<sub>2</sub> thin films*, *Micromachines*, 9(8), 389 (2018)
21. Ioannis Papagiannis, Elias Doukas, Alexandros Kalarakis, George Avgouropoulos and Panagiotis Lianos, «Photoelectrocatalytic H<sub>2</sub> and H<sub>2</sub>O<sub>2</sub> Production Using Visible-Light-Absorbing Photoanodes», *Catalysts* 9, 243; doi:10.3390/catal9030243 (2019)
22. Christina D. Polyzou, Ondřej Malina, Jiří Tuček, Radek Zbořil, Nikos Panagiotou, Anastasios J. Tasiopoulos, Nikos Boukos, John Parthenios, Alexandros N. Kalarakis and Vassilis Tangoulis, «Spin Crossover Phenomenon in Microcrystals and Nanoparticles of a [Fe(2-mpz)<sub>2</sub>Ni(CN)<sub>4</sub>] Two-Dimensional Hofmann-Type Polymer: A Detailed Nano-Topographic Study», *Inorg. Chem.* 58(20), pp. 13733-13736 (2019) (<https://doi.org/10.1021/acs.inorgchem.9b01405>)
23. Vassilis Kostopoulos, Athanasios Kotrotsos, Kalliopi Fouriki, Alexandros Kalarakis and Diana Portan, «Fabrication and Characterization of Polyetherimide Electrospun Scaffolds Modified with

- Graphene Nano-Platelets and Hydroxyapatite Nano-Particles*», Int. J. Mol. Sci. 21(2), 583 (2020) (<https://doi.org/10.3390/ijms21020583>)
24. M.Bidikoudi, A.N.Kalarakis, E.Stathatos, «A facile, low-cost and industrially feasible method to implement complex structured perovskites, in stable, C-based perovskite solar cells», Solar Energy 220, Pages 660-670 (2021) (<https://doi.org/10.1016/j.solener.2021.04.007>)
  25. D.A. Chalkias, A. Karavioti, A.N. Kalarakis, E. Stathatos, «Unveiling the importance of dripping temperature control of hybrid organic-inorganic perovskite precursor solution for the fabrication of fully ambient air-processed perovskite solar cells», Solar Energy 1017–1027, 224 (2021) (<https://doi.org/10.1016/j.solener.2021.06.074>)
  26. Aggeliki Karavioti, Dimitris A. Chalkias, Giannis Katsagounos, Argyroula Mourtzikou, Alexandros N. Kalarakis and Elias Stathatos, «Toward a Scalable Fabrication of Perovskite Solar Cells under Fully Ambient Air Atmosphere: From Spin-Coating to Inkjet-Printing of Perovskite Absorbent Layer», Electronics 1904, 10 (2021) (<https://doi.org/10.3390/electronics10161904>)
  27. Tsirkas A. Sotirios, Kalarakis Alexandros, Tsolou Georgia & Spyropoulos Konstantinos, «Experimental Investigation of the Effect of Turning Cutting Parameters on Surface Roughness and Material's Microstructure as a Factor of Turning Speed Versus Feed Rate», International Journal of Mechanical and Production Engineering Research and Development (IJMPERD) Vol. 11, Issue 5, Oct 2021, 179–192
  28. Chalkias Dimitris A; Mourtzikou Argyroula, Katsagounos Giannis, Karavioti Aggeliki, Kalarakis Alexandros N.; Stathatos Elias. «Suppression of Coffee-Ring Effect in Air-Processed Inkjet-Printed Perovskite Layer toward the Fabrication of Efficient Large-Sized All-Printed Photovoltaics: A Perovskite Precursor Ink Concentration Regulation Strategy», Solar RRI, 2200196 (2022) (DOI: 10.1002/solr.202200196)
  29. Gianni, E., Panagiotaras, D., Giannakis, I., Papoulis, D.,Bekiari, V., Panagopoulos, G., Kalarakis, A.N., «Palygorskite-TiO<sub>2</sub> nanocatalysts for Tebuconazole degradation in water», Water and Environment Journal (2023) (DOI: 10.1111/wej.12842)
  30. Panagiotis Parissis, Alexandros Romeos, Athanasios Giannadakis, Alexandros Kalarakis, Michail Peroulis, «Computational Study of Hemodynamic Field of an Occluded Artery Model with Anastomosis», Bioengineering 10(2), 146 (2023) (DOI: <https://doi.org/10.3390/bioengineering10020146>)
  31. Lalioti, Nikolia, Giannopoulou, Efstathia, Charitos, Alexander, Parthenios, Ioannis, Malina, Ondrej, Polaskova, Michaela, Kalarakis, Alexandros, Tangoulis, Vassilis, «Observation of two-step spin transition in iron(II) 4-amino-1,2,4-triazole based spin crossover nanoparticles», Dalton Transactions, 52, 2937–2941 (2023) (DOI: 10.1039/d2dt04118a)
  32. D.A.Chalkias, A. Mourtzikou, G. Katsagounos, A.N. Kalarakis and E. Stathatos «Development of Greener and Stable Inkjet-Printable Perovskite Precursor Inks for All-Printed Annealing-Free Perovskite Solar Mini-Modules Manufacturing», Small Methods (submitted-under review - manuscript ID: smtd.202300313)

## 8. Additional information

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Google Scholar: <https://scholar.google.com/citations?user=izVFgaWskWoC&hl=el&oi=ao>

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