

Curriculum Vitae

Alexandros G. Vanakaras

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Alexandros G. Vanakaras, born in 1970, is Professor of computational/theoretical materials science at the department of Materials Science of University of Patras, Greece. He is a member of the administration board of the interdepartmental MSc and PhD programme “Polymer Science and Technology” of University of Patras and Chair of the MSc programme of the Department of Materials Science. Is author/co-author of over 45 publications in peer reviewed journals, and his work has received more than 1200 citations. He has given more than 20 plenary and invited talks at national and international meetings.

Higher Education

1992 Diploma in Physics, University of Patras, Greece.

1997 PhD in Physics, University of Patras

Thesis title: *Specific Interactions and Molecular Organization in Liquid Crystals*.

Research and Academic Employment

1996 Research scholar at CINECA (Italy) super-computing center.

1996/97 PhD researcher, Department of Chemistry, University of North Carolina, Chapel Hill, NC.

1999 Postdoctoral researcher, Department of Physics, University of Patras (Greece).

2000 Postdoctoral researcher, Department of Physical Chemistry, University of Bologna (Italy).

2001/02 Postdoctoral researcher, Department of Materials Science, University of Patras (Greece).

2002-06 Lecturer, Department of Materials Science, University of Patras (Greece)

2007-12 Assistant Professor, Department of Materials Science, University of Patras (Greece)

2012-18 Associate Professor, Department of Materials Science, University of Patras (Greece)

2018- Professor, Department of Materials Science, University of Patras (Greece)

Research Interests

Soft matter molecular theory & simulations.

Statistical Mechanics of complex fluids and their self-organization.

Liquid Crystals: molecular organization, domain structure and alignment.

Dendrimers and dendronised polymers: massive molecular flexibility, mesomorphism, structure and nanomechanics.

Chiral (enantio)discrimination in soft matter

Fullerene containing liquid crystals.

Pattern formation via molecular self-assembly.

Colloidal self-organization and stability.

Metamaterials through molecular self-assembly.

Teaching Activity

Undergraduate courses: Statistical Mechanics. Computational Materials Science. Probability and Stochastic Processes. Science and Technology of Liquid Crystals. Scientific Computing.

Graduate courses: Physical Chemistry and Statistical Thermodynamics of Materials. Statistical Mechanics of Macromolecules. Molecular Materials. Computer Simulations of Polymers. Physical Chemistry of Polymers. Advanced Polymers.

Research Supervision

Postdoctoral trainees: Dr. S. Droulias (2009-2012), Dr. N. Fytas (2009-2010), Dr. Th.Kalos (2010-2012), Dr. S. Peroukidis (2012-2014), Dr. Z. G. Workineh (2014-2015).

Graduate students: G. Tritsarlis (MSc, 2007), Eva Karatairi (PhD, 2012), I. Chatziaadi (MSc, 2013), F. Priftis (MSc 2015), Zerihun G. Workineh (PhD 2015), Anant Kumar (Co-Supervisor, PhD, 2017), A. Kontarini (Co-supervisor, MSc, 2017), K. Papageorgiou (MSc, 2018). D. Lymperopoulos (MSc, 2019 (*Computer Modelling and Simulation of Aerogels*)).

Ongoing Research Supervision

Fotios Priftis (PhD student with IKY scholarship, 2015-today, (*Entropy driven chiral pattern formation in two dimensional systems of achiral particles.*); Barbaki Aimilia (MSc student, 2019-today, electrooptics of novel liquid crystals), Supervision of 5 undergraduate students doing their research projects (2019-2020).

International conference organization and research editorship activities

- Scientific Secretary of the *12th European Conference on Liquid Crystals, Rhodes, Greece* (2013).
- Organizer of the *International School on Modeling and Computer Simulation Methods for Dendrimers, Patras, 2011*
- Guest Editor of *Molecular Crystals and Liquid Crystals*, Cordon & Breach, 2015.
- *Editorial board of:*
 - *Annals of Materials Science & Engineering*, Austin Publishing Group (2014 -)
 - *Crystlas, MDPI*, (2011-)
- *Member of the “International Liquid Crystal Society: ILCS”,* (2015 -)
- *Member of the International Advisory Board (IAB) of the 28th International Liquid Crystal Conference (ILCC2020) to be held in Lisbon, Portugal, 2020.*

Research Grants

2020-2021	<i>Nanoparticles dispersed in Liquid crystals: theoretical and experimental study towards new functional materials.</i> (ESF, Education and Life Long Learning Operational Programme) Role in the project: PI Total Budget: ~41 k€
2018-2020	<i>Effects of chirality, polarity and anisotropy in molecular self-assembly in two dimensions,</i> Consejo Nacional de Ciencia y Tecnología (CONACYT, Mexico) Role in the project: PI of the Greek Participation. Total Budget: ~80 k€

2012-2015	<i>Nanoparticles Dispersed In Liquid-Crystalline Media: Organization And Complexity In Novel Soft Matter Systems</i> (NANOLICR), "Thales", Mis: 380170 Role in the project: Team Leader for University of Patras Total Budget: 520 k€
2009-2013	Self-organized Nanomaterials for tailored optical and electrical properties (NANOGOLD). EU-FP7-NMP-2008-2.2-2 Role in the project: Member of the Greek Research Group Total Budget: 4.6 M€ (460 k€, Upatras)
2008-2012	Functional LC Dendrimers: Synthesis of New Materials, Resource for New Applications. (DENDREAMERS), EU-FP7-PEOPLE-ITN, Marie Curie Actions Role in the project: Member of the Greek Research Group Total Budget: 4.2 M€ (439 k€, Upatras)
2008-2012	Biaxial Nematic Devices (BIND), EU-FP7 / ICT-1-3.2 / STREP-CP-FP-I Role in the project: Member of the Greek Research Group Total Budget: 3.2 M€ (441 k€, Upatras)
2005-2009	« <i>Νανοσκοπικοί Υβριδικοί Φωτονικοί Αισθητήρες Αερίων</i> », PENED Role in the project: Team Leader for University of Patras Total Budget: 140 k€
2007-2009	“ <i>Janus Amphiphiles. Investigating new molecular organizations in soft matter</i> ”, Royal Society of Chemistry (UK) Role in the project: PI for University of Patras Total Budget: 20k€
2002-2005	“Molecular Design, Theoretical Studies and Computer Simulations of Novel Liquid Crystalline Phases”, University of Patras, Programme K. Karatheodori Role in the project: PI Total Budget: 24k€

Publications in peer-reviewed journals

[50]	<i>On the spontaneous mirror symmetry breaking in 2D systems composed of achiral equilateral triangles</i> A. G. Vanakaras and F. Priftis, submitted for publication (2020).
[49]	<i>Probing Molecular Ordering in the Nematic Phases of Bimesogens through NMR Spectra of Flexible Prochiral Solutes</i> L.M. Heist, E.T. Samulski, C. Welch, Z. Ahmed, G. H. Mehl ² , A. G. Vanakaras and D. J. Photinos, <i>Liquid Crystals</i> , DOI: 10.1080/02678292.2019.1711214 (2020)
[48]	<i>The Twist Bend Nematic: A Case of Mistaken Identity.</i> E.T. Samulski, A.G. Vanakaras, and D.J. Photinos, submitted for publication (2019)
[47]	<i>Molecular dynamics simulations of nematic phases formed by cyano-biphenyl dimers</i> AG Vanakaras, DJ Photinos, <i>Liquid Crystals</i> 45 (13-15), 2184-2196, (2018).
[46]	<i>Polar molecular ordering in the N_x phase of bimesogens and enantiotopic discrimination in the NMR spectra of rigid prochiral solutes.</i> A. Kumar, A. G. Vanakaras, D. J. Photinos, <i>J. Phys. Chem. B</i> , 121 (47), 10689-10703 (2017).
[45]	<i>Molecular Interactions in Chiral Nematic Liquid Crystals and Enantiotopic Discrimination through the NMR Spectra of Achiral Molecules I: Rigid Solutes</i> A. Kumar, A. G. Vanakaras, D. J. Photinos, <i>J. Phys. Chem. B</i> , 120 (41), 10844-10853, (2016).

[44]	Self-organisation and alignment properties of homeotropically confined model liquid crystalline dendrimer systems Z.G. Workineh, A.G. Vanakaras, <i>Liquid Crystals</i> , 43 (7), 944-954, (2016)
[43]	Homogeneous Alignment of Liquid Crystalline Dendrimers Confined in a Slit-Pore: Computational Simulation Study Z.G. Workineh and A.G. Vanakaras, <i>J. of Physics: Condensed Matter</i> , 28 (11), 115002, (2016).
[42]	A Molecular Theory of Nematic–Nematic Phase Transitions in Mesogenic Dimers A.G. Vanakaras, D.J. Photinos, <i>Soft Matter</i> 12 (7), 2208-2220, (2016). As of November/December 2016, this paper received enough citations to place it in the top 1% of the academic field of Materials Science based on a highly cited threshold for the field and publication year. <i>Data from Essential Science IndicatorsSM</i>
[41]	Strong Magnetochiral Dichroism in Suspensions of Magnetoplasmonic Nanohelices V. Yannopapas, A.G. Vanakaras, <i>ACS Photonics</i> 2 (8), 1030-1038, (2015).
[40]	Molecular Simulation Study of Polar Order in Orthogonal Bent-Core Smectic Liquid Crystals S.D. Peroukidis, A.G. Vanakaras, D.J. Photinos, <i>Phys. Rev. E</i> 91 (6), 06250, (2015).
[39]	On the Structure of the Nx Phase of Symmetric Dimers: Inferences from NMR A. Hoffmann, A.G. Vanakaras, A. Kohlmeier, G.H. Mehl, D.J. Photinos, <i>Soft Matter</i> 11 (5), 850-855 (2015). As of November/December 2016, this paper received enough citations to place it in the top 1% of the academic field of Materials Science based on a highly cited threshold for the field and publication year. <i>Data from Essential Science IndicatorsSM</i>
[38]	Plasmonic Response of Ordered Arrays of Gold Nanorods Immersed Within a Nematic Liquid Crystal S.D. Peroukidis, V. Yannopapas, A.G. Vanakaras, S. Droulias, D.J. Photinos, <i>Liquid Crystals</i> 41 (10), 1430-1435 (2014).
[37]	Surface Induced Ordering on Model Liquid Crystalline Dendrimers, Z.G. Workineh and A.G. Vanakaras, <i>Polymers</i> 6 (8), 2082-2099, (2014).
[36]	Supramolecular Nature of the Nematic-Nematic Phase Transitions of Hard Boardlike Molecules S.D. Peroukidis, A.G. Vanakaras and D.J. Photinos, <i>Phys. Rev. E</i> , 88 , 062508 (2013).
[35]	Phase Diagram of Hard Board Like Colloids from Computer Simulations S. D. Peroukidis, A G. Vanakaras, <i>Soft Mater</i> , 9 , 7419-7423 (2013).
[34]	Light Scattering by a Metallic Nanoparticle Coated with a Nematic Liquid Crystal V. Yannopapas, N. Fytas, V. Kyrimi, E. Kallos, A.G. Vanakaras, D.J. Photinos <i>Physica Status Solidi A</i> , 210 (2), 335-340 (2013).
[33]	Layer-Multiple-Scattering Theory for Metamaterials Made From Clusters of Nanoparticles V. Yannopapas and A.G. Vanakaras, <i>Phys. Rev. B</i> , 84 , 085119 (2011).
[32]	Dirac Point in the Photon Dispersion Relation of a Negative/Zero/Positive-Index Plasmonic Metamaterial V. Yannopapas, A.G. Vanakaras, <i>Phys. Rev. B</i> , 84 , 045128, (2011).
[31]	<i>Molecular Simulation of Hierarchical Structures in the Nematic Phases of Bent-Bore Mesogens</i> S. D. Peroukidis, A. G. Vanakaras and D. J. Photinos, <i>Phys. Rev. E</i> , 84 , 010702(R) (2011).
[30]	<i>Liquid Crystalline Mixtures and Demixing in Binary Mixtures of Shape Anisometric Colloids</i> S.D. Peroukidis, A.G. Vanakaras and D.J. Photinos, <i>J. Mat. Chem.</i> 20 (46), 10495-10502, (2010). (INVITED, Published in the Error! Hyperlink reference not valid. Modelling of Materials Error! Hyperlink reference not valid. Error! Hyperlink reference not valid.)
[29]	Extending the Maier-Saupe theory to Cybotactic Nematics S. Droulias, A.G. Vanakaras and D.J. Photinos, <i>Liq. Cryst.</i> , 37 (6-7), 969-976 (2010). (INVITED)

[28]	Two Dimensional Ordered Porous Patterns by Molecular Design G. Tritsarlis and A.G. Vanakaras, <i>Langmuir</i> , 26 (11), 7808-7812 (2010).
[27]	Symmetries and Alignment of Biaxial Nematic Liquid Crystals P.K. Karahaliou, A.G. Vanakaras and D.J. Photinos, <i>J. Chem. Phys.</i> , 131 124516 (2009).
[26]	Biaxial Nematics: Symmetries, Order Domains and Field-Induced Phase Transitions S.D. Peroukidis, P.K. Karahaliou, A.G. Vanakaras and D.J. Photinos, <i>Liq. Cryst.</i> 36 (6), 727-737 (2009). (Invited)
[25]	<i>Polymer Brushes on Periodically Nanopatterned Surfaces</i> A. Koutsioubas and A.G. Vanakaras, <i>Langmuir</i> , 24 (23), 13717–13722 (2008).
[24]	Molecular Modeling of Liquid Crystalline Self-Organisation of Fullerodendrimers: Columnar to Lamellar Phase Transitions Driven by Temperature and/or Concentration Changes S.D. Peroukidis, A.G. Vanakaras and D.J. Photinos, <i>J. Phys. Chem. B</i> , 112 , 12761-12767 (2008).
[23]	Thermotropic Biaxial Liquid Crystals: Spontaneous or Field Stabilized? A.G. Vanakaras and D.J. Photinos, <i>J. Chem. Phys.</i> 128 , 154512 (2008).
[22]	Self-Organisation of Fullerene-Containing Conical Supermesogens S.D. Peroukidis, A.G. Vanakaras and D.J. Photinos, <i>Soft Matter</i> 4 , 493-499 (2008).
[21]	Helix Formation in Linear Achiral Dendronized Polymers. A Computer Simulation Study D.K. Christopoulos, A.F. Terzis, A.G. Vanakaras and D.J. Photinos, <i>J. Chem. Phys.</i> 125 , 204907 (2006).
[20]	Self Organization and Pattern Formation of Janus Particles in Two Dimensions by Computer Simulations A.G. Vanakaras, <i>Langmuir</i> , 22 , 88-93 (2006).
[19]	A Simple Theory of Molecular Organization in Fullerene Containing Liquid Crystals S. D. Peroukidis, A.G. Vanakaras and D. J. Photinos, <i>J. Chem. Phys.</i> , 123 , 164904 (2005). (Selected for the November 7, 2005 issue of <i>Virtual Journal of Nanoscale Science & Technology</i> .)
[18]	<i>Molecular Theory of Dendritic Liquid Crystals: Self-Organization And Phase Transitions</i> A.G. Vanakaras and D.J. Photinos, <i>J. of Mater. Chem.</i> , 15 , 2002-2012 (2005).
[17]	On the Molecular Theory of Dimer Liquid Crystals P.K. Karahaliou, A.G. Vanakaras and D.J. Photinos, <i>Liquid Crystals</i> , 32 , 1397-1407 (2005).
[16]	Structure and Nanomechanics of Linear Dendronised Polymers: A Molecular Simulation Study D.K. Christopoulos, D.J. Photinos, L.M. Stimson, A.F. Terzis and A.G. Vanakaras, <i>J. Mater. Chem.</i> , 13 , 2756-2764 (2003). (Invited).
[15]	The Phase Behaviour of a Binary Mixture of Rod-Like and Disc-Like Mesogens: Monte Carlo Simulation, Theory and Experiment A. Galindo, A.J. Haslam, S. Varga, G. Jackson, A.G. Vanakaras, D.J. Photinos and D.A. Dunmur, <i>J. Chem. Phys.</i> , 119 (10), 5216 (2003).
[14]	Theory and Simulation of Biaxial Nematic and Orthogonal Smectic Phases Formed by Mixtures of Board-Like Molecules A.G. Vanakaras, M.A. Bates and D.J. Photinos, <i>Phys. Chem. Chem. Phys.</i> , 5 , 3700 – 3706 (2003).
[13]	Polar Molecular Organisation in Liquid Crystals (Invited). A. G. Vanakaras and D.J. Photinos, <i>Molec.Cryst. Liq. Cryst.</i> , 395 , 213-231 (2003).

[12]	Dipole Strength Effects on the Polymorphism in Smectic-A Mesophases R. Berardi, S. Orlandi, D. J. Photinos, A. G. Vanakaras and C. Zannoni, <i>Phys. Chem. Chem. Phys.</i> , 4 (5), 770 (2002).
[11]	Tilt Order Parameters, Polarity and Inversion Phenomena in Smectic Liquid Crystals P.K. Karahaliou, A.G. Vanakaras and D.J. Photinos, <i>Phys. Rev. E</i> , 65 , 031712 (2002).
[10]	Ordered Fluids of Globular Supermolecules (Invited). A.G. Vanakaras and D.J. Photinos, <i>J. Mater. Chem.</i> , 11 , 2832 (2001).
[9]	The Smectic Phase of Spherical-Fan Shaped Molecules. A Computer Simulation Study A.G. Vanakaras and D.J. Photinos, <i>Chem. Phys. Lett.</i> , 341 , 129 (2001).
[8]	On the Molecular Requirements for the Stabilization of Thermotropic Biaxial Ordering in Rod-Plate Nematics (Invited). A.G. Vanakaras, A.F. Terzis and D.J. Photinos, <i>Molec. Cryst. Liq. Cryst.</i> , 362 , 67 (2001)
[7]	Conformational Phase Transitions and Re-Entrance Phenomena in Dendromesogens A.F. Terzis, A.G. Vanakaras and D.J. Photinos, <i>Molec. Cryst. Liq. Cryst.</i> , 352 , 265 (2000).
[6]	Theory of Molecular Deformations and Mesomorphic Behaviour of Dendrimers A.F. Terzis, A.G. Vanakaras and D.J. Photinos, <i>Molec. Cryst. Liq. Cryst.</i> , 330 , 1761 (1999).
[5]	Tilt, Polarity and Spontaneous Symmetry Breaking in Liquid Crystals A.G. Vanakaras, D.J. Photinos and E.T. Samulski, <i>Phys. Rev E</i> , 57 , R4875 (1998).
[4]	Hydrogen Bonding and Phase Biaxiality in Nematic Rod-Plate Mixtures A.G. Vanakaras, S.C. McGrother, G. Jackson and D.J. Photinos, <i>Molec. Cryst. Liq. Cryst.</i> , 323 , 199 (1998).
[3]	Theory of Biaxial Nematic Ordering in Rod-Disc Mixtures Revisited A.G. Vanakaras and D.J. Photinos, <i>Molec. Cryst. Liq. Cryst.</i> , 299 , 65 (1997).
[2]	Electric Dipoles and Phase Stability in Nematic Liquid Crystals A.G. Vanakaras and D.J. Photinos, <i>Molec. Phys.</i> , 85 , 1089 (1995).
[1]	The Interactions of Small Chain Solutes in Nematic Solvents A.G. Vanakaras and D.J. Photinos, <i>Molec. Cryst. Liq. Cryst.</i> , 262 , 463 (1995).

Book Chapters

•	Electrodynamic Theory of Three-Dimensional Metamaterials of Hierarchically Organized Nanoparticles V. Yannopapas, A. G. Vanakaras and D. J. Photinos, in <i>Amorphous Nanophotonics</i> , C. Rockstuhl and T. Scharf (Editors), Springer-Verlag Berlin Heidelberg 2013
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Selected invited talks to peer-reviewed, internationally established conferences

•	“Entropy Driven Spontaneous Mirror Symmetry Breaking in 2D Systems Composed of Achiral Particles” A. G. Vanakaras and F. Priftis 25 th International School of Liquid Crystals, E. Majorana Centre for Scientific Culture, Erice (Italy), 7-10 October, 2018.
•	“Entropy driven self-assembly and spontaneous ordering in soft matter” A. G. Vanakaras Workshop on “Self-Assembly in Soft Matter”, University of Patras, 1-2 September, 2015

•	<p>“Theory and molecular simulations of biaxial nematics: long standing challenges and recent advancements” <u>A. G. Vanakaras</u>, S. D. Peroukidis, S. D. Droulias and D. J. Photinos 25th International Liquid Crystal Conference, ILCC2014, Dublin, Ireland, 29 June-4 July 2014</p>
•	<p>“Biaxial Nematics: Symmetry and Hierarchical Domain Structure” A. G. Vanakaras Isaac Newton Institute, “<i>Workshop on Analytical and Computational Paths from Molecular Foundations to Continuum Descriptions</i>”, Isaac Newton Institute for Mathematical Sciences, Cambridge, 18 - 22 March (2013).</p>
•	<p>“Modeling of dendromesogens: Self organization and phase transitions, alignment and nano confinement” A. Kumar, Z. Workineh, <u>A. G. Vanakaras</u>, D. J. Photinos NaNaX5: "Nanoscience with nanocrystals", Fuengirola (Spain), 07 – 11 May, (2012).</p>
•	<p>“Optical properties of metamaterials of metallic nanoparticles embedded in nematic liquid crystals” V. Yannopapas, A. G. Vanakaras and D. J. Photinos 10th Mediterranean Workshop and Topical Meeting "Novel Optical Materials and Applications" (NOMA 2011), Cetraro-Italy, June 05-11, (2011)</p>
•	<p>“Hierarchical Domain Structure in Nematics” S.D. Peroukidis, S. Droulias, <u>A.G. Vanakaras</u>, D.J. Photinos, 23rd International Liquid Crystal Conference (ILCC2010), 11-16 July, Krakow, Poland (2010).</p>