Stavros X. Drakopoulos

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EDUCATION

Oct 2016 – Sept 2019
Doctor of Philosophy, Materials Engineering
Department of Materials, Loughborough University, UK
Dissertation Title: Disentangled ultra-high molecular weight polyethylene and its nanocomposites: Relaxation dynamics, entanglement formation and anisotropic properties due to orientation

Oct 2011 – Aug 2016
Bachelor of Science, Materials Science
Department of Materials Science, University of Patras, Greece
Thesis Title: Chemical composition, thermomechanical behavior and electrical response of biocomposite thermoplastic starch matrix materials, reinforced with latex and cellulose particles

RESEARCH EXPERIENCE

Jun 2023 – present
Associate Research Scholar, Priestley Lab, Princeton University, NJ, USA
- Comparative study between the dynamic glass transition and the thermodynamic glass transition temperature of pyrene-modified polystyrene in the bulk and in thin film configurations, examined via broadband dielectric spectroscopy, ellipsometry, fluorimetry, and differential scanning calorimetry.
- Investigating the frequency and temperature dependent dielectric relaxation processes of random (methyl methacrylate)/(4-tert-butylstyrene) co-polymers (*in collaboration with Prof. Richard A. Register, Princeton University*).
- Dielectric relaxation analysis of vitrimer polymers to understand their thermally activated bond-exchange reactions in a dynamic environment (*in collaboration with Prof. Erin E. Stache, Princeton University*).

Dec 2021 – Mar 2023
Postdoctoral Research Associate, Asadi Lab, University of Bath, England, UK
Examined the dielectric properties of conjugated polymers and blends, polymer nanodielectrics and solid-state polymer electrolytes (*in collaboration with Prof. Aurora Nogales, IEM-CSIC, and Dr Maica Morant Miñana, CIC energiGUNE*).

Mar 2020 – Nov 2021
Faraday Institution Research Fellow, Energy Materials Group, University of Birmingham, England, UK
Designed, developed and tested graphite-based electrodes for Li-ion batteries by correlating the electrochemical performance with the manufacturing processing via machine learning (*in collaboration with Ansys UK Ltd and Intellegens Ltd*).

Oct 2016 – Sept 2019
Graduate Researcher, Soft Matter Group, Loughborough University, England, UK
- Developed nanocomposites based on disentangled ultra-high molecular weight polyethylene employing various nanofillers (metallic, ceramic, organic).
- Investigated the temperature and angle dependence of thermal conductivity of uniaxially oriented dis-UHMWPE nanocomposites (*in collaboration with Prof. Austin J. Minnich, California Institute of Technology*).
- Examined the frequency and temperature dependent dielectric properties and capacitive energy storage of dis-UHMWPE nanocomposites (*in collaboration with Prof. Georgios C. Psarras, University of Patras*).

Oct 2014 – May 2016
Undergraduate Researcher, Smart Materials & Nanodielectrics Lab, University of Patras, Greece
Examined the frequency and temperature dependent dielectric properties of thermoplastic starch composites reinforced with microfibrillated cellulose and/or natural rubber latex microparticles via broadband dielectric spectroscopy.

Jun 2014 – Sept 2014	**Erasmus Placement Researcher**, Karger-Kocsis Lab, Budapest University of Technology and Economics, Hungary Developed thermoplastic starch composites reinforced with microfibrillated cellulose and/or natural rubber latex microparticles.

SCHOLARSHIPS, PRIZES & HONOURS

2025 – present	**Society Membership** at the American Physical Society (APS). Part of the following groups: • Polymer Physics Division • Condensed Matter Physics Division
2024	**Peter Debye Prize for Young Investigators for Excellence in Dielectric Research** I was presented with the award with the following citation: '*Dr Drakopoulos has enhanced our compensation of polymers by identifying the universal scaling principles that govern DC conductivity. He achieved this by analyzing the frequency dependence of the dielectric response. Additionally, he has contributed to the development of materials for energy storage applications.*' after I received support from 3 nominators, members of the International Dielectric Society (IDS). The award is issued biannually by IDS, and it was presented to me at a ceremony held during the 12th Conference on Broadband Dielectric Spectroscopy and its Applications, in Lisbon, Portugal. https://the-dielectric-society.org/debye/stavros-x-drakopoulos
2019	**D.H. Richards Memorial Travel Bursary** funded by the Macro Group of the Royal Society of Chemistry to cover conference expenses.
2018 – present	**Society Membership** at the Royal Society of Chemistry (MRSC). Part of the following groups: • Polymer Physics Group • Macro Group UK • Electrochemistry Group
2018 – present	**Society Membership** at the International Dielectric Society (IDS).
2016 – 2019	**University Research Studentship** provided by the School of Aeronautic, Automotive, Chemical and Materials Engineering, Loughborough University, for 3 years to fully cover graduate research (student fees and salary).
2014	**Erasmus Placement Scholarship** funded by the University of Patras, Greece.

SUCCESSFUL PROPOSALS FOR USER FACILITIES

2018 – 2019	Allocated beam time in the ‘’Institut Laue-Langevin’’, Grenoble, France, under the supervision of Dr. Ingo Hoffmann. The techniques employed were neutron spin echo spectroscopy and small angle neutron scattering.
2018	Allocated beam time in the ‘’European Synchrotron Radiation Facility’’, Grenoble, France, under the supervision of Dr. Daniel Hermida Merino. The techniques employed were small- / wide- angle X-ray scattering.

RESEARCH FUNDING PROPOSALS

SEAS-Innovation Grant (Princeton University) - *PENDING*

PI: Dr Lilia Xie │**co-PI**: Dr Stavros X. Drakopoulos

2025 — The overall objective is to incorporate inorganic–organic nanosheets with chemically tunable interfaces into solution-processable polymers to generate a new class of complex dielectric materials.

Total Anticipated Amount: *$169,734*

PUBLICATIONS IN PEER-REVIEWED JOURNALS

**denotes corresponding author(s) / [§]denotes co-first author(s)*

26. **S.X. Drakopoulos*** (2025) Revisiting the dielectric spectrum: Tricks and treats of analysis and interpretation around the conductivity relaxation. *IET Nanodielectrics*. 8(1):e70020. DOI: 10.1049/nde2.70020.

25. S.M. Maguire, C. Nie, S.V. Sundar, **S.X. Drakopoulos**, P.J. Chirik, R.D. Priestley*, E.C. Davidson* (2025) Modulating Poly(oligocyclobutane) Properties Through Backbone Modifications. *Macromolecules*, 58(17):9469-9482. DOI: 10.1021/acs.macromol.5c01592

24. **S.X. Drakopoulos*[§]**, K. Loukelis[§], M. Triantafyllou-Rundell, C.C. Stoumpos, M. Chatzinikolaidou, G.C. Psarras (2025) Fabrication of all-organic nanodielectrics reinforced with electrospun polymer fibres for capacitive energy storage. *RSC Applied Polymers* 3, 960-972. DOI: 10.1039/D5LP00029G

23. **S.X. Drakopoulos***, O. Vryonis, Z. Špitalský, H. Peidayesh, L. Lendvai* (2024) Thermoplastic starch processed under various manufacturing conditions: thermal and electrical properties. *Biomacromolecules* 25(9):5938–5948. DOI: 10.1021/acs.biomac.4c00602

22. **S.X. Drakopoulos**, J. Wu, S.M. Maguire, S. Srinivasan, K. Randazzo, E.C. Davidson, R.D. Priestley* (2024) Polymer nanocomposites: Interfacial properties and capacitive energy storage. *Progress in Polymer Science* 156:101870. DOI: 10.1016/j.progpolymsci.2024.101870

21. **S.X. Drakopoulos***, K. Loukelis, M. Triantafyllou-Rundell, C.C. Stoumpos, M. Chatzinikolaidou, G.C. Psarras (2024) Epoxy/clay nanodielectrics: From relaxation dynamics to capacitive energy storage. *Advanced Composites and Hybrid Materials* 7:118. DOI: 10.1007/s42114-024-00924-4

20. **S.X. Drakopoulos***, J. Cui, M. Asandulesa, P.W.M. Blom, A. Nogales, K. Asadi* (2024) Universal scaling of DC conductivity with dielectric interfacial polarization in conjugated polymers. *Macromolecules* 57(6):2661-2668. DOI: 10.1021/acs.macromol.3c02556

19. **S.X. Drakopoulos***, Z. Špitalský, H. Peidayesh, L. Lendvai* (2023) The effect of drying of glycerol-plasticized starch upon its dielectric relaxation dynamics and charge transport. *Journal of Polymers and the Environment* 31:5389-5400. DOI: 10.1007/s10924-023-02962-3

18. **S.X. Drakopoulos**, T. Cowell, E. Kendrick* (2023) Graphite-SiO_x electrodes with a biopolymeric binder for Li-ion batteries: Predicting the cycle life performance from physical properties. *ACS Applied Energy Materials* 6(12):6543-6553. DOI: 10.1021/acsaem.3c00488

17. **S.X. Drakopoulos***, J. Yang, O. Vryonis, L. Williams, G.C. Psarras, E. Mele (2022) Flexible polymer-based nanodielectrics reinforced with electrospun composite nanofibres for capacitive energy storage. *ACS Applied Polymer Materials* 4(11):8203-8215. DOI: 10.1021/acsapm.2c01162

16. T. Kim, **S.X. Drakopoulos**, S. Ronca, A.J. Minnich* (2022) Origin of high thermal conductivity in disentangled ultra-high molecular weight polyethylene films: ballistic phonons within enlarged crystals. *Nature Communications* 13:2452. DOI: 10.1038/s41467-022-29904-2

15. **S.X. Drakopoulos***, A.C. Patsidis, G.C. Psarras (2022) Epoxy-based $BaTiO_3$ nanodielectrics: Relaxation dynamics, charge transport and energy storage. *Materials Research Bulletin* 145:111537. DOI: 10.1016/j.materresbull.2021.111537

14. **S.X. Drakopoulos**, A. Gholamipour-Shirazi, P. MacDonald, R.C. Parini, C.D. Reynolds, D.L. Burnett, B. Pye, K.B. O'Regan, G. Wang, T.M. Whitehead, G.J. Conduit, A. Cazacu, E. Kendrick* (2021) Formulation and manufacturing optimization of lithium-ion graphite-based electrodes via machine learning. *Cell Reports Physical Science* 2:100683. DOI: 10.1016/j.xcrp.2021.100683

13. **S.X. Drakopoulos***, G.C. Manika, A. Nogales, T. Kim, A.B. Robbins, G. Claudio, A.J. Minnich, T.A. Ezquerra, G.C. Psarras I. Martin-Fabiani, S. Ronca (2021) Gold/ultra-high molecular weight polyethylene nanocomposites for electrical energy storage: Enhanced recovery efficiency upon uniaxial deformation. *Journal of Applied Polymer Science* 138:51232. DOI: 10.1002/app.51232

12. I. Martin-Fabiani*, **S.X. Drakopoulos**, G. Forte, S. Prévost, I. Hoffmann, S. Ronca (2021) Chain dynamics of ultra-high molecular weight polyethylene composites with graphene oxide nanosheets. *ACS Macro Letters* 10:460-465. DOI: 10.1021/acsmacrolett.1c00007

11. **S.X. Drakopoulos***, G.C. Psarras S. Ronca (2021) Oriented ultra-high molecular weight polyethylene/gold nanocomposites: Electrical conductivity and chain entanglement dynamics. *eXPRESS Polymer Letters* 15(6):492-502. DOI: 10.3144/expresspolymlett.2021.42

10. **S.X. Drakopoulos***, O. Tarallo, L. Guan, I. Martin-Fabiani, S. Ronca (2020) Nanocomposites of Au/Disentangled UHMWPE: A combined optical and structural study. *Molecules* 25:3225. DOI: 10.3390/molecules25143225

9. **S.X. Drakopoulos***, J. Karger-Kocsis, G.C. Psarras (2020) The effect of micro-fibrillated cellulose upon the dielectric relaxations and DC conductivity in thermoplastic starch bio-composites. *Journal of Applied Polymer Science* 137(48):49573. DOI: 10.1002/app.49573

8. **S.X. Drakopoulos***, G. Forte, S. Ronca (2020) Relaxation dynamics in disentangled ultrahigh molecular weight polyethylene via torsional rheology. *Industrial & Engineering Chemistry Research* 59:4515-4523. DOI: 10.1021/acs.iecr.9b06401

7. A.B. Robbins, **S.X. Drakopoulos**, I. Martin-Fabiani, S. Ronca, and A.J. Minnich* (2019) Ballistic thermal phonons traversing nanocrystalline domains in oriented polyethylene. *Proceedings of the National Academy of Sciences* 116:17163-17168. DOI: 10.1073/pnas.1905492116

6. **S.X. Drakopoulos**, J. Karger-Kocsis, G.C. Psarras* (2019) In situ thermodielectric analysis of the gelatinization mechanism of raw maize starch: An experimental and theoretical approach. *Journal of Polymers and the Environment* 27:333-342. DOI: 10.1007/s10924-018-1348-7

5. **S.X. Drakopoulos***, G.C. Psarras, G. Forte, I. Martin-Fabiani, S. Ronca (2018) Entanglement dynamics in ultra-high molecular weight polyethylene as revealed by dielectric spectroscopy. *Polymer* 150:35-43. DOI: 10.1016/j.polymer.2018.07.021

4. D. Nocita*, G. Forte, **S.X. Drakopoulos**, A. Visco, A. Gianporcaro, S. Ronca (2017) Processing and characterization of bio-polyester reactive blends: From thermoplastic blends to cross-linked networks. *Polymer* 132:256-263. DOI: 10.1016/j.polymer.2017.10.069

3. **S.X. Drakopoulos**, J. Karger-Kocsis, Á. Kmetty, L. Lendvai, G.C. Psarras* (2017) Thermoplastic starch modified with microfibrillated cellulose and natural rubber latex: A broadband dielectric spectroscopy study. *Carbohydrate Polymers* 157:711-718. DOI: 10.1016/j.carbpol.2016.10.036

2. L. Lendvai, J. Karger-Kocsis*, Á. Kmetty, **S.X. Drakopoulos** (2016) Production and characterization of microfibrillated cellulose reinforced thermoplastic starch composites. *Journal of Applied Polymer Science* 133:42397. DOI: 10.1002/app.42397

1. J. Karger-Kocsis, Á. Kmetty, L. Lendvai, **S.X. Drakopoulos**, T. Bárány* (2015) Water-Assisted Production of Thermoplastic Nanocomposites: A Review. *Materials* 8:72-95. DOI: 10.3390/ma8010072

PRE-PRINTS AND SUBMISSIONS

**denotes corresponding author(s) / §denotes co-first author(s)*

※ **S.X. Drakopoulos***, S. Kim, R.A. Register, R.D. Priestley* (2025) Segmental dynamics and local motions in disordered random co-polymers. Under review in *Nature Communications*.

※ H.-L. Sun§, **S.X. Drakopoulos§**, L. Čamdžić, S. Maguire, R.D. Priestley*, E.E. Stache* (2025) Polyacrylate Vitrimer Network via In-Situ Isocyanide Copolymerization: Synthesis and Molecular Dynamics. Under review in *JACS*. DOI: 10.26434/chemrxiv-2025-crn0f-v2 (*Chemarxiv*)

※ M.M. Abolhasani§, **S.X. Drakopoulos§**, M.H. Amiri, H.S. Dehsarii, K. Asadi* (2025) High temperature nanodielectrics based on polymer grafted metallic nanoparticles. Under review in *Nature Communications*.

BOOK CHAPTERS

2. **S.X. Drakopoulos** (2024) Dielectric Relaxation and Transport Dynamics of Solid-State Polymer Electrolytes. In '*Batteries – The Future of Energy Storage*' (Ed: S. Maniam) published by Jenny Stanford Publishing, pp. 117-153. DOI: 10.1201/9781003512882

1. **S.X. Drakopoulos**, S. Ronca, I. Martin-Fabiani (2020) Dielectric behavior of nonpolar polymers and their composites: The case of semicrystalline polyolefins. In '*Dielectrics and Crystallization*' (Eds: T.A. Ezquerra & A. Nogales) part of the *Advances in Dielectrics* book series published by Springer International Publishing, pp. 243-265. DOI: 10.1007/978-3-030-56186-4_10

PATENTS

2. **S.X. Drakopoulos** (November 2016) A Method of Improving the Piezoelectric Charge Coefficient in Composite Piezoelectric Materials. *Hellenic Industrial Property Organization* GR 1009017.

1. **S.X. Drakopoulos** (December 2014) Piezoelectric Engine. *Hellenic Industrial Property Organization* GR 1008662.

CONFERENCE PARTICIPATION

Oral Presentations

7. ''Dielectric properties and relaxation dynamics of poly(acrylate-co-isocyanide) vitrimers'' **S.X. Drakopoulos**, H.-L. Sun, L. Čamdžić, E.E. Stache, R.D. Priestley (July 20-25, 2025, Barcelona, Spain). INVITED Oral Presentation at the 10th International Discussion Meeting on Relaxations in Complex Systems.

6. ''Dielectric relaxation dynamics in (methyl methacrylate)/(4-tert-butylstyrene) random co-polymers'' **S.X. Drakopoulos**, S. Kim, R.A. Register, R.D. Priestley (March 16-21, 2025, Anaheim, CA, USA). Oral Presentation at the APS Joint March Meeting and April Meeting: Global Physics Summit 2025.

5. ‘’Relaxation dynamics in poly(methyl methacrylate)/poly(4-tert-butylstyrene) systems produced via thermal initiated random co-polymerization’’ **S.X. Drakopoulos**, S. Kim, R.A. Register, R.D. Priestley (September 9-11, 2024, Edinburg, United Kingdom). Oral Presentation at the Physical Aspects of Polymer Science 2024 conference.

4. ‘’Segmental Relaxation of Polystyrene Modified with Pyrene Molecules’’ **S.X. Drakopoulos**, K. Randazzo, S. Liu, R.D. Priestley (September 1-6, 2024, Lisbon, Portugal). Oral Presentation at the 12th Conference on Broadband Dielectric Spectroscopy and its Applications.

3. ‘’Thermal phonons with micron-scale mean free paths in ultra-drawn polyethylene’’ T. Kim, **S.X. Drakopoulos**, I. Martin-Fabiani, A. Robbins, S. Ronca, A. Minnich (March 2-6, 2020, Denver, Colorado, USA). Oral Presentation at the APS March Meeting 2020.

2. ‘’Au/ultra-high molecular weight polyethylene nanodielectrics: the effect of calendering on the electrical energy storage potential’’ **S.X. Drakopoulos**, G.C. Manika, G.C. Psarras, S. Ronca (May 5-8, 2019, Budapest, Hungary). Oral Presentation at the 6th International Symposium Frontiers in Polymer Science.

1. ‘’Understanding the Evolution of Entanglements upon the Dielectric Relaxations in dis-UHMWPE in the Presence of Al_2O_3 Catalytic Ashes’’ **S.X. Drakopoulos**, G.C. Psarras, S. Ronca (August 26-31, 2018, Brussels, Belgium). Oral Presentation at the 10th Conference on Broadband Dielectric Spectroscopy and its Applications.

Poster Presentations

12. ‘’Segmental dynamics and local motions in disordered random co-polymers’’ **S.X. Drakopoulos**, S. Kim, R.A. Register, R.D. Priestley (July 20-25, 2025, Barcelona, Spain). Poster Presentation at the 10th International Discussion Meeting on Relaxations in Complex Systems.

11. ‘’Pyrene-functionalized polystyrene: Thermodynamic and dynamic properties of the glass transition in the bulk and under confinement’’ **S.X. Drakopoulos**, K. Randazzo, S. Liu, R.D. Priestley (March 16-21, 2025, Anaheim, CA, USA). Poster Presentation at the APS Joint March Meeting and April Meeting: Global Physics Summit 2025.

10. ‘’A Dielectric and Calorimetric Investigation of Modified Cellulose Polymers’’ K. Zuravel, **S.X. Drakopoulos**, R.D. Priestley (October 27-31, 2024, San Diego, CA, USA). Poster Presentation at the AIChE Annual Meeting 2024.

9. ‘’Relaxation Dynamics of Hydroxypropylmethylcellulose Acetate Succinate: via Dielectric and Mechanical Methods’’ **S.X. Drakopoulos**, Y. Sao, R.D. Priestley (September 1-6, 2024, Lisbon, Portugal). Poster Presentation at the 12th Conference on Broadband Dielectric Spectroscopy and its Applications.

8. ‘’Universal scaling of DC conductivity with dielectric interfacial polarization in conjugated polymers’’ **S.X. Drakopoulos**, K. Asadi (June 23-28, 2024, Dresden, Germany). Poster Presentation at the International Conference on Science and Technology of Synthetic Electronic Materials ICSM 24.

7. ‘’Probing the Impact of Chain Architecture on Segmental Dynamics in Semi-Crystalline Poly(oligocyclobutane)’’ S.M. Maguire, **S.X. Drakopoulos**, C. Nie, R.A. Register, P.J. Chirik, R.D. Priestley, E.C. Davidson (March 4-8, 2024, Minneapolis, Minnesota, USA). Poster Presentation at the APS March Meeting 2024.

6. ‘’Uniaxially oriented UHMWPE in the presence of ZnO nanoparticles or β-carotene: A small/wide-angle X ray scattering study’’ **S.X. Drakopoulos**, I. Martin-Fabiani, S. Ronca (June 24-28, 2019, Naples & Sorrento, Italy). Poster Presentation at the 5th Blue Sky Conference on Catalytic Olefin Polymerization.

5. ‘’Relaxation dynamics of disentangled UHMWPE as revealed by broadband dielectric spectroscopy and torsional rheology’’ **S.X. Drakopoulos**, G. Forte, G.C. Psarras, S. Ronca (June 24-28, 2019, Naples & Sorrento, Italy). Poster Presentation at the 5th Blue Sky Conference on Catalytic Olefin Polymerization.

4. ‘’Au/ultra-high molecular weight polyethylene nanocomposites: the effect of calendering on structural and thermal properties’’ **S.X. Drakopoulos**, I. Martin-Fabiani, A. Nogales, T.A. Ezquerra, G. Claudio, S. Ronca (May 5-8, 2019, Budapest, Hungary). Poster Presentation at the 6th International Symposium Frontiers in Polymer Science.

3. ‘’Electrospinning Effect on the Relaxation Molecular Dynamics of Poly(D,L-Lactide) via Dielectric Relaxation Spectroscopy’’ **S.X. Drakopoulos**, G.C. Psarras, P. Wang, S. Ronca, D. Nocita, E. Mele (September 9-13, 2018, Maastricht, Netherlands). Poster Presentation at the 29th European Conference on Biomaterials.

2. ‘’Swelling and Plasticization Phenomena of Semi-Crystalline Microfibrillated Cellulose: An Investigation via Dielectric Relaxation Spectroscopy’’ **S.X. Drakopoulos**, G.C. Psarras, J. Karger-Kocsis (November 5-7, 2015, Athens, Greece). Poster Presentation at the 1st International Conference ‘Science in Technology’.

1. ‘’Chemical Composition and Characterization of Thermoplastic Starch Biomicrocomposites and Hybrids, Reinforced with Latex and Cellulose Microparticles’’ **S.X. Drakopoulos**, G.C. Psarras, L. Lendvai, Á. Kmetty, J. Karger-Kocsis (December 4-6, 2014, Patras, Greece). Poster Presentation at the 10th Hellenic Polymer Society Conference, with International Participation.

EDITORIAL ACTIVITY

- Topic Editor for *Crystals MDPI* (ISSN 2073-4352) and Guest Editor for the Special Issue: ‘’Polymer Dielectrics: Crystalline Materials as Energy Storage Systems’’.
- Reviewer at the following journals: *Nature Communications, ACS Applied Electronic Materials, ACS Applied Polymer Materials, Carbohydrate Polymers, Crystals, Industrial & Engineering Chemical Research, Industrial Crops and Products, JACS Au, Journal of Materials Science, Journal of Materials Science and Technology, Journal of Polymers and the Environment, Macromolecules, Micro & Nano Letters, npj Computational Materials, Polymer Bulletin, Polymer Engineering & Science, RSC Advances, Soft Matter*.

OUTREACH

2023	**Invited presentation to undergraduate and graduate students** Department of Materials Science, University of Patras, Greece
2018	**Invited presentation to researchers and faculty members** Department of Biobased Materials, Maastricht University, The Netherlands
2017	**Invited presentation to undergraduate and graduate students** Department of Materials Science, University of Patras, Greece
2017	**Non-scientific article to promote materials science** (in *Greek*) MENSA Magazine (2017) 42:46-47.
2015	**Invited presentation to high school students to promote materials science** 4th High School of Petroupolis, Athens, Greece