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Engineering & Scientific Consulting

Mike Dimitriou, Ph.D.

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Professional Profile

Dr. Dimitriou is a polymer scientist who specializes in the design, manufacture, and performance of materials used in building and construction, energy generation, automotive, industrial coating, medical, electronic, and consumer product industries. With formulating and materials testing experience on polymer and composite systems, Dr. Dimitriou guides clients in product development, materials selection and processing, patent and trade secret analysis, service life, and failure analysis.

Dr. Dimitriou's areas of expertise include surface analysis, polymer rheology, chemical, thermal, and mechanical testing of coatings, adhesives, sealants, fibers, non-wovens, rubbers, elastomers, thermoplastics, thermosets, gels, and novel polymer materials. He has research experience defining the structure-property-processing relationships of polymer systems including block copolymers, polymeric surfactants, polymer blends, polymer brushes, confined films, hydrogels, and hierarchical structures.

Dr. Dimitriou has assessed building products including insulation, windows, IGUs, carpet, roofing, flooring, siding, sealants, and caulking from the perspective of design, service life, weathering, and failure analysis. He has addressed issues related to formulation, application, and performance of paints and protective coatings applied to a range of products and substrates. Additionally, he has performed project evaluations of components used in automotive environments, wind and solar energy generation, biomedical, and consumer products. He has direct product development experience using polymer processing techniques such as extrusion, injection molding, and fiber spinning.

Dr. Dimitriou's training and experience is in polymer physics and synthesis, utilizing material design and processing conditions to yield the physical properties of choice for polymer-based applications. He has extensive research, testing and project experience with a variety of thermomechanical [rheology, Dynamic Mechanical Analysis (DMA), Differential Scanning Calorimetry (DSC), Thermogravimetric Analysis (TGA)], surface characterization [Fourier Transform Infrared (FTIR) spectroscopy, X-ray Photoelectron Spectroscopy (XPS), Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), Near Edge X-ray Absorption Fine Structure (NEXAFS) spectroscopy, surface energy measurements, dynamic Secondary Ion Mass Spectrometry (dSIMS)], macromolecular [Gel Permeation Chromatography (GPC), Nuclear Magnetic Resonance (NMR)], and scattering [Dynamic Light Scattering (DLS), X-ray and neutron scattering, ellipsometry] characterization techniques. He is experienced in methods of polymer coating and thin film deposition including spin coating, spray coating, doctor blade, vapor deposition, and Langmuir-Blodgett deposition.

Prior to joining Exponent, Dr. Dimitriou worked at the National Institute of Standards and Technology's Center for Neutron Research, where he utilized a variety of X-ray and neutron scattering techniques to investigate water uptake in organic sensors and protective coatings, polymer interdiffusion in confined thin films, and antibody interactions at a membrane interface. There he became versed with neutron activation of materials and safe handling protocols. Dr. Dimitriou's doctoral work, funded by the Office of

Naval Research, focused on incorporating fluorocarbons (PFAS) into materials to tune surface properties and improve performance. This strategy was used to engineer both an anti-biofouling coating for marine vessels and a lithographic template for patterning in semiconductor manufacturing.

Academic Credentials & Professional Honors

Ph.D., Materials, University of California, Santa Barbara, 2011

B.S., Materials Science and Engineering, Massachusetts Institute of Technology (MIT), 2006

National Research Council Postdoctoral Fellowship

Materials Research Laboratory Diversity Fellow

CPS Technologies Fellowship

Academic Appointments

George Mason University Department of Chemistry & Biochemistry, Adjunct Professor

Arizona State University, Invited Lecturer

Prior Experience

National Research Council Postdoctoral Fellow, NIST Center for Neutron Research, 2011-2013

Professional Affiliations

Fenestration & Glazing Industry Alliance (FGIA) - Technical Services Committee

Soft Matter Association of the Americas (SMAA) - Advisory Board Member

BioPACIFIC Materials Innovation Platform User Program – Proposal Reviewer

American Physical Society

American Chemical Society

NIST Chapter of Sigma Xi

Massachusetts Institute of Technology Educational Council

Languages

Greek

Publications

Dimitriou, M., Moll, J., and Reitman, M., Polymer Materials in Architectural Applications: Building on Traditional Knowledge and Innovative Technologies in Materials Selection for Long-Term Success. In Architectural Plastics & Polymer Composites in the 21st Century Conference Proceedings Plus (Vol I). The Technology Organization Inc., Somerville, MA, 2021

Reitman, M. T. F., Dimitriou, M. D., Vargas, J. R., & Madden, S. B. (2020). Why is service life prediction of

polymers and plastics exposed to outdoor weathering important? An industrial perspective. In C. C. White, M. E. Nichols, & J. E. Pickett (Eds.), Service Life Prediction of Polymers and Coatings (pp. 19-32). William Andrew Publishing. https://doi.org/10.1016/B978-0-12-818367-0.00002-3

Kempe K, Wylie RA, Dimitriou MD, Tran H, Hoogenboom R, Schubert US, Hawker CJ, Campos LM, Connal LA. Preparation of non-spherical particles from amphiphilic block copolymers. Journal of Polymer Science Part A: Polymer Chemistry 2015; 54(6):750-757.

Jiang N, Sendogdular L, Di X, Sen M, Gin P, Endoh MK, Koga T, Akgun B, Dimitriou MD, Satija S. Effect of CO2 on a Mobility Gradient of Polymer Chains near an Impenetrable Solid. Macromolecules 2015; 48(6):1795-1803.

Chen JJ, Conron SM, Erwin P, Dimitriou MD, McAlahney K, Thompson ME. High Efficiency BODIPY Based Organic Photovoltaics. ACS Applied Materials & Interfaces 2015; 7(1):662-669.

Vaish A, Vanderah DJ, Richter LJ, Dimitriou MD, Steffens KL, Walker ML. Dithiol-based modification of poly(dopamine): enabling protein resistance via short-chain ethylene oxide oligomers. Chemical Communications 2015; 51(30): 6591-6594.

Galvin CJ, Dimitriou MD, Satija SK, Genzer J. Swelling of polyelectrolyte and polyzwitterion brushes by humid vapors. Journal of the American Chemical Society 2014; 136(36):12737-12745.

Vaish A, Krueger S, Dimitriou MD, Majkrzak C, Vanderah DJ, Chen L, Gawrisch K. Enhancing the platinum atomic layer deposition infiltration depth inside anodic alumina nanoporous membrane. Journal of Vacuum Science & Technology A: Vacuum, Surfaces, and Films 2015; 33, 01A148.

Asada M, Jiang N, Sendogdular L, Sokolov J, Endoh MK, Koga T, Fukuto M, Yang L, Akgun B, Dimitriou MD, Satija S. Melt crystallization/dewetting of ultrathin PEO films via carbon dioxide annealing: the effects of polymer adsorbed layers. Soft Matter 2014; 10(34):6392-6403.

Dimitriou MD, Kramer EJ, Hawker CJ. Advanced Techniques for the Characterization of Surface Structure in Polymer Thin Films and Coatings. Arabian Journal for Science and Engineering 2014 39(1):1-13.

Killops KL, Gupta N, Dimitriou MD, Lynd NA, Jung H, Tran H, Bang J, Campos LM. Nanopatterning biomolecules by block copolymer self-assembly. ACS Macro Letters 2012; 1(6):758-763.

Dimitriou MD, Martinelli E, Fischer DA, Galli G, Kramer EJ. Surface organization of a perfluorocarbon-functionalized polystyrene homopolymer. Macromolecules 2012; 45(10):4295-4302.

Cho Y, Sundaram HS, Finlay JA, Dimitriou MD, Callow ME, Callow JA, Kramer EJ, Ober CK. Reconstruction of surfaces from mixed hydrocarbon and PEG components in water: Responsive surfaces aid fouling release. Biomacromolecules 2012; 13(6):1864-1874.

Dimitriou MD, Sundaram HS, Cho Y, Paik MY, Kondo M, Schmidt K, Fischer DA, Ober CK, Kramer EJ. Amphiphilic block copolymer surface composition: Effects of spin coating versus spray coating. Polymer 2012; 53(6):1321-1327.

Dimitriou MD, Zhou Z, Yoo HS, Killops KL, Finlay JM, Cone G, Sundaram HS, Lynd NA, Barteau KP, Campos LM, Fischer DA, Callow ME, Callow JA, Ober CK, Hawker CJ, Kramer EJ. A general approach to controlling the surface composition of poly(ethylene oxide)-based block copolymers for antifouling coatings. Langmuir 2011; 27 (22):13762-13772.

Sundaram HS, Cho Y, Dimitriou MD, Finlay JA, Cone G, Williams S, Handlin D, Gatto J, Callow ME, Callow JA, Kramer EJ, Ober CK. Fluorinated amphiphilic polymers and their blends for fouling-release applications: The benefits of a triblock copolymer surface. ACS Applied Materials Interfaces 2011; 3(9):3366-3374.

Sundaram HS, Cho Y, Dimitriou MD, Weinman CJ, Finlay JA, Cone G, Callow ME, Callow JA, Kramer EJ, Ober CK. Fluorine-free mixed amphiphilic polymers based on PDMS and PEG side chains for fouling release applications. Biofouling 2011; 27 (6001):589-602.

Jang SG, Khan A, Dimitriou MD, Kim BJ, Lynd NA, Kramer EJ, Hawker CJ. Synthesis of thermally stable Au-core/Pt-shell nanoparticles and their segregation behavior in diblock copolymer mixtures. Soft Matter 2011; 7 (13):6255-6263.

Choi SQ, Jang SG, Pascall AJ, Dimitriou MD, Kang T, Hawker CJ, Squires TM. Synthesis of multifunctional micrometer-sized particles with magnetic, amphiphilic, and anisotropic properties. Advanced Materials 2011; 23(20):2348-2352.

Cho Y, Sundaram HS, Weinman CJ, Paik MY, Dimitriou MD, Finlay JA, Callow ME, Callow JA, Kramer EJ, Ober CK. Triblock copolymers with grafted fluorine-free, amphiphilic, non-ionic side chains for antifouling and fouling-release applications. Macromolecules 2011; 44(12):4783-4792.

Treat ND, Campos LM, Dimitriou MD, Ma B, Chabinyc ML, Hawker CJ. Nanostructured hybrid solar cells: Dependence of the open circuit voltage on the interface composition. Advanced Materials 2010; 22(44):4982-4986.

Park D, Weinman CJ, Finlay JA, Fletcher BR, Paik MY, Sundaram HS, Dimitriou MD, Sohn KE, Callow ME, Callow JE, Handlin DL, Willis CL, Fischer DA, Kramer EJ, Ober CK. Amphiphilic Surface active triblock copolymers with mixed hydrophobic and hydrophilic side chains for tunes marine fouling-release properties. Langmuir 2010; 26(12):9772-9781.

Tang CB, Hur SM, Stahl BC, Sivanandan K, Dimitriou MD, Pressly E, Fredrickson GH, Kramer EJ, Hawker CJ. Thin film morphology of block copolymer blends with tunable supramolecular interactions for lithographic applications. Macromolecules 2010; 43(6):2880-2889.

Gupta N, Lin BF, Campos LM, Dimitriou MD, Hikita ST, Treat TD, Tirrell MV, Clegg DO, Kramer EJ, Hawker CJ. A versatile approach to high-throughput microarrays using thiolene chemistry. Nature Chemistry 2010; 2(2):138-145.

Campos LM, Truong TT, Shim DE, Dimitriou MD, Shir D, Meinel I, Gerbec JA, Hahn TH, Rogers JA, Hawker CJ. Applications of photocurable PMMS Thiol-ene stamps in soft lithography. Chemistry of Materials 2009; 21(21):5319-5326.

Weinman CJ, Finlay JA, Park D, Paik MY, Krishnan S, Sundaram HS, Dimitriou MD, Sohn KE, Callow ME, Callow JA, Handlin DL, Willis CL, Kramer EJ, Ober CK. ABC triblock surface active block copolymer with grafted ethoxylated fluoroalkyl amphiphilic side chains for marine antifouling/fouling-release applications. Langmuir 2009; 25(20):12266-12274.

Sohn KE, Dimitriou MD, Genzer J, Fischer DA, Hawker CJ, Kramer EJ. Depth profiling the near surface of polymer films using NEXAFS spectroscopy. Langmuir 2009; 25(11):6341-6348.

Presentations

Streifel, B, Dimitriou MD. Fluorinated Materials in Automotive Applications. Oral Presentation, Household & Commercial Products Association Mid-Year Meeting – Industrial & Automotive Division Meeting, Washington, DC, May 2024.

Dimitriou, MD, Streifel, B. PFAS in Packaging Applications: Navigating PFAS Reporting Requirements and Alternatives to Fluorinated Materials. Oral Presentation, SPE – Per- and Polyfluoroalkyl Substances (PFAS) in the Plastics Industry (2024), Baltimore, MD, October 2024

Galvin C, Dimitriou MD, Satija S, Genzer J. Water uptake and swelling of weak polyelectrolyte bruses in a humid environment. Oral Presentation American Physical Society National Meeting, San Francisco, CA, 2014.

Dimitriou MD, Galvin CJ, Satija SK, Genzer J. Measuring graft stability in a tethered polyelectrolyte film by X-ray and neutron reflectivity. Poster presentation, American Physical Society National Meeting, Baltimore, MD, 2013.

Akgun BA, Dimitriou MD, Satija SK. How does Tg reduction affect the chain mobility in confined polymer films? Poster presentation, American Physical Society National Meeting, Baltimore, MD, 2013.

Dimitriou MD, Akgun BA, Satija SK. The effect of Tg reduction on chain mobility in confined polystyrene films. Poster presentation, NIST Sigma Xi, Gaithersburg, MD, 2013.

Akgun BA, Dimitriou MD, Satija SK. How does Tg reduction affect chain mobility at interfaces? Poster presentation, American Conference on Neutron Scattering, Washington, DC, 2012.

Dimitriou MD, Zhou Z, Yoo HS, Killops KL, Finlay JM, Cone G, Sundaram HS, Lynd NA, Barteau KP, Campos LM, Fischer DA, Callow ME, Callow JA, Ober CK, Hawker CJ, Kramer EJ. Anti-biofouling performance of amphiphilic block copolymer coatings. Poster presentation, Gordon Research Conference, Ventura, CA, 2012.

Dimitriou MD, Hawker CJ, Kramer EJ. Utilizing perfluorocarbons to control surface composition of a polystyrene-b-poly(2-vinylpyridine) block copolymer. Oral presentation American Physical Society National Meeting, Dallas, TX, 2011.

Dimitriou MD, Ober CK, Hawker CJ, Kramer EJ. Functionalized block copolymers for anti-biofouling applications. Invited talk, UCSB Materials Research Outreach Program, Santa Barbara, CA, 2011.

Dimitriou MD, Hawker CJ, Kramer EJ. Surface composition and morphology of fluorine end-functionalized poly(2-vinylpyridine) in a poly(2-vinypyridine) homopolymer. Poster presentation, American Physical Society National Meeting, Portland, OR, 2010.

Dimitriou MD, Ober CK, Kramer EJ. Surface analytical methods with depth sensitivity for anti-fouling coatings. Poster presentation, ONR Coatings/Biofouling Review, Portland, OR, 2010.

Dimitriou MD, Hawker CJ, Kramer EJ. Surface segregation of end-functionalized homopolymers in a homopolymer matrix. Poster presentation, American Physical Society National Meeting, Pittsburgh, PA, 2009.