

KAREN P. CORTÉS-GUZMÁN

Chemist • Researcher • Materials

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Research chemist with over 8 years of experience in organic synthesis, formulation and design of polymeric materials and characterization of structural and thermomechanical properties. Skilled in developing materials for additive manufacturing, materials for building envelopes like adhesives, insulation foams, sealants and flame retardants. Proven record of industry collaborations, multidisciplinary R&D teamwork, technology commercialization, and securing research funding. Passionate about sustainability, mentorship, interdisciplinary teamwork, and advancing circular economy solutions through innovative chemical approaches.

Areas of Expertise

- Renewable/Sustainable materials
- Thermomechanical characterization
- Organic synthesis and characterization
- Additive Manufacturing/3D Printing
- Wet lab chemistry techniques
- Written and oral scientific dissemination
- Experimental design/ Data analysis
- Creative/ Problem-solving
- Life Cycle Assessment
- Critical thinking-driven research
- Analytical techniques/Spectroscopy
- Standardized materials testing

Research Experience

JUNE 2023 – PRESENT

Postdoctoral Research Associate, Polymer Chemist | Oak Ridge National Laboratories | Knoxville, TN.

- Result-driven innovative material development for building envelopes such as adhesives, composites, sealants, flame retardants and insulation foams reducing costs, improving performance and lowering carbon footprint and toxicity.
- R&D in multiple multidisciplinary projects, leading the experimental design and collaborating with researchers, industrial partners, project and program managers to accomplish milestones, submit monthly reports, overcome challenges and redesign strategies.
- Writing of invention disclosures, patent applications, research proposals, and academic papers.
- Mentor undergraduate and PhD students in research, training them in organic synthesis laboratory skills, thermomechanical characterization, material development, and science communication.

AUGUST 2019 – JUNE 2023

Graduate Research Assistant | The University of Texas at Dallas | Richardson, TX.

- Designed, synthesized and evaluated sustainable resins for 3D printing, leveraging dynamic covalent chemistry and renewable feedstocks resulting in robust materials with smart properties like self-healing, reprocessing and chemical recycling.
- Created and led a sustainability officer position in a student organization, developing sustainability-driven outreach activities, propitiated implementation of sustainability practices in chemistry laboratories.
- Volunteered with the Texas Stream Team to monitor the quality of the water bodies inside the university to comply with state regulations
- Mentored undergraduate and master's students, guiding research execution, thesis writing, strengthening their communication skills and co-authoring publications

AUGUST 2019 – JUNE 2023

Research Assistant | Universidad Autonoma del Estado de Morelos | Cuernavaca, MOR. Mexico

- Conducted kinetic studies on solvent-free one-pot reactions and performed green chemistry driven synthesis of small molecules with pharmaceutical properties
- Mentored undergraduate students in experimental design, synthetic laboratory skills, materials characterization and communication skills

Education

MAY 2023

Doctor of Philosophy in Chemistry | The University of Texas at Dallas | Richardson, TX.

Dissertation: Sustainable Resins for Vat Photopolymerization 3D Printing Using Dynamic Covalent Chemistry. Advisor: Dr. Ronald Smaldone

DECEMBER 2018

Bachelor of Science in Industrial Chemistry | Universidad Autonoma del Estado de Morelos | Cuernavaca, MOR. Mexico

First in class (GPA: 9.89/10) • Thesis: Kinetic studies of the “solvent-free” Diels-Alder type dimerization of *tert*-butyl 3-(3-methoxy-3-oxoprop-1-en-2-yl)-1*H*-indole-1-carboxylate. Advisor: Dr. Jaime Escalante

Peer Reviewed Publications

- Perera, S. D.; Johnson, R. M.; Pawle, R.; Elliott, J.; Tran, T.; Gonzalez, J.; Huffstetler, J.; Ayers, L. C.; Ganesh, V.; Senarathna, M. C.; **Cortés-Guzmán, K. P.**; Dube, S.; Springfield, S.; Hancock, L. F.; Lund, B. R.; Smaldone, R. A. Hierarchically Structured Metal–Organic Framework Polymer Composites for Chemical Warfare Agent Degradation. *ACS Appl. Mater. Interfaces*. 2024 16 (8), 10795-10804.
- Parikh, A. R.; **Cortés-Guzmán, K. P.**; Bian, N.; Johnson, R. M.; Smaldone, R. A.; Lu, H.; Voit, W. E. Surface-methacrylated microcrystalline cellulose bioresins with soybean oil for additive manufacturing via vat photopolymerization. *J. Polym. Sci.* 2024, 62 (12), 2692-2703.
- **Cortés-Guzmán, K. P.**, Parikh, A. R., Sparacin, M. L., Johnson, R. M., Adegoke, L., Ecker, M., Voit, W. E., & Smaldone, R. A. Thermal annealing effects on the mechanical properties of bio-based 3D printed thermosets. *Polymer Chemistry*. 2023. 14, 2697–2707.
- Johnson, R. M.; **Cortés-Guzmán, K. P.**; Perera, S. D.; Parikh, A. R.; Ganesh, V.; Voit, W. E.; Smaldone, R. A. Lignin-Based Covalent Adaptable Network Resins for Digital Light Projection 3D Printing. *J. Polym. Sci.* 2023, 1. 2023, 1.
- **Cortés-Guzmán, K. P.**, Parikh, A. R., Sparacin, M. L., Remy, A. K., Adegoke, L., Chitrakar, C., Ecker, M., Voit, W. E., & Smaldone, R. A.. Recyclable, Biobased Photoresins for 3D Printing Through Dynamic Imine Exchange. *ACS Sus. Chem. Eng.* 2022. 10, 13091–13099.
- Durand-Silva, A.; **Cortés-Guzmán, K. P.**; Johnson, R. M.; Perera, S. D.; Diwakara, S. D.; Smaldone, R. A. Balancing Self-Healing and Shape Stability in Dynamic Covalent Photoresins for Stereolithography 3D Printing. *ACS Macro Lett.* 2021, 10, 486–491.
- Berry, D. R.; **Cortés-Guzmán, K. P.**; Durand-Silva, A.; Perera, S. D.; Remy, A. K.; Yan, Q.; Smaldone, R. A. Supramolecular Tools for Polymer Additive Manufacturing. *MRS Commun.* 2021, 11, 146–156.
- Valdez-Camacho, J. R.; **Cortés-Guzmán, K. P.**; Torres-Gómez, H.; Flores, R.; Leyva, M. A.; Escalante, J. Kinetics, Thermodynamics, and Theoretical Studies in a Diels-Alder Dimerization Process of 3-Vinylindole Derivative of the 3-Indoleacetic Acid: An Auxin. *ChemistrySelect*. 2019, 4.

Additional Qualifications

- Life Cycle Assessment: Quantifying Environmental Impacts | MIT Professional Education | Digital Plus Programs –March 2025
- R&D artifacts/patents:
 - Hun D.E., Saito T., Demchuk Z., Shrestha S.S., Cortes-Guzman, K. P. Plant sourced insulation foam. Patent application 63/461,646.
 - Aldykiewicz A., Demchuk Z., Hun D.E., Saito T., Tang M. Biobased flame retardants. Invention Disclosure 202405623.
- Languages: Spanish (native) | English (proficient) | German (basic)
- Software & Tools: Microsoft 365, Origin, ChemDraw, TopSpin, OpenLCA, Repetrel, Photon Workshop, Tinkercad, UltiMaker Cura, Blender 3D, Python (basic)