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Engineering & Scientific Consulting

Tom Kolibaba, Ph.D.

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Professional Profile

Dr. Tom Kolibaba is a scientist specializing in polymer science, with emphasis on polymer processing, flame retardant coatings, and photopolymer additive manufacturing. He has extensive experience in developing functional materials for protective applications, including fire prevention and gas barrier coatings, and has contributed to the commercial implementation of novel material technologies.

Dr. Kolibaba's technical expertise spans monomer synthesis, purification, and polymerization techniques such as free radical, photopolymerization, and ring-opening metathesis polymerization (ROMP). His doctoral research focused on environmentally benign, water-based coatings for protective applications. He has developed flame retardant formulations for wood which resulted in a commercialized flame retardant coating.

In the area of additive manufacturing, Dr. Kolibaba has developed and optimized resin chemistries for vat photopolymerization 3D printing. His work includes the formulation of novel materials such as polyelectrolytes, hydrogels, and elastomers, as well as materials with specialized properties including flame resistance, scintillation, and high dielectric breakdown. He is experienced in diagnosing and improving printing reliability through analysis of 3D printer hardware — particularly light engines — and resin performance.

Dr. Kolibaba is proficient in a wide range of characterization techniques. His expertise includes small molecule analysis (e.g. UV-Vis, FTIR, NMR, GC-MS), polymer characterization (e.g. GPC, DMA, DSC, TGA), and advanced microscopy (e.g. SEM and multiple AFM modalities including contact mode, tapping mode, scanning Kelvin probe force microscopy, and conductive AFM). He has collaborated with academic institutions and government laboratories to advance material performance and reliability in demanding applications.

Academic Credentials & Professional Honors

Ph.D., Chemistry, Texas A&M University, 2021

B.S., Chemistry, Pacific Lutheran University, 2016

2023 MML Postdoctoral Fellow Accolade (NIST)

2022 Sustainability Award (RadTech)

Academic Appointments

Lecturer, Chemistry Department, University of Colorado Boulder, 2023-2024

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Prior Experience

Research Chemist, National Institute for Standards and Technology, 2023-2025

National Research Council Postdoctoral Fellow, National Institute for Standards and Technology, 2021-2023

Professional Affiliations

2013-Present, American Chemical Society (POLY and PMSE Division membership)

Patents

T.J. Kolibaba, J.P. Killgore, “MAKING A HYDROGEL FROM A SACRIFICIAL IONIC SCAFFOLD” U.S. Patent Application Serial Number 19/058,167 (Filed July 24, 2025).

J.C. Grunlan, T.J. Kolibaba, “FLAME-RETARDANT COATINGS INCLUDING POLYELECTROLYTE” U.S. Patent Application Serial Number 18/849,313 (Filed June 19, 2025).

T.J. Kolibaba, J.P. Killgore, “ADDITIVE MANUFACTURING POLYELECTROLYTE RESIN AND ADDITIVELY MANUFACTURING” U.S. Patent Application Serial Number 18/206,667 (Filed June 7, 2023).

Publications

Selected

T.J. Kolibaba, J.P. Killgore, B.W. Caplins, R.J. Wendland, U. Arp, C.C. Miller, Y. Zong, C.I. Higgins, J.L. Sharp, S. Broce, T. Wang, V. Talačka, A. Ilginis, J. Andersson, A. Davenport, M.A. Panzer, J.M. Gonzalez, M-D. Bui-Nguyen, R. Nickoloff, K. Billerbeck, A.M. Clay, M.R. Fratarcangeli, H.J. Qi, D.H. Porcincula, L.B. Bezek, D. Babcock, B. Kohlbush, K. Kikuta, M.N. Pearlson, D.A. Walker, E. Hasa, A. Aguirre-Soto, A. Celis-Guzman, D.M. Shah, D.E. Backman, R.L. Sridhar, K.A. Cavicchi, R.J. Viereckl, E. Tong, C.J. Hansen, C. Harms, A. Pena-Francesch, C. Antonini, R. Chaudhary, G. Muraca, Y. Bensouda, Y. Zhang, X. Zhao, X. Allonas, Results of an Interlaboratory Study on the Working Curve in Vat Photopolymerization II: Towards a Standardized Method, Additive Manufacturing, 2025, 110, 104919.

E.T. Iverson, H. Legendre, J.P. Killgore, J.C. Grunlan, T.J. Kolibaba^, Remarkable Dielectric Breakdown Strength of Printable Polyelectrolyte Photopolymer Complexes, ACS Macro Letters, 2024, 13, 1325.

A.P. Dhand, M.D. Davidson, H.M. Zlotnick, T.J. Kolibaba, J.P. Killgore, J.A. Burdick, Additive Manufacturing of Highly Entangled Polymer Networks, Science, 2024, 385, 566.

T.J. Kolibaba^, B.W. Caplins, C.I. Higgins, E. Mansfield, S.L. Miller, C. Chandler, J.P. Killgore, Tailoring Properties of 3D-Printable Polyelectrolyte Photopolymer Complexes with Reactive Diluents, ACS Applied Polymer Materials, 2024, 6, 6957.

B.W. Caplins, T.J. Kolibaba, U. Arp, C.C. Miller, Y. Zong, D.L. Poster, C.I. Higgins, J.P. Killgore, Influence of Spectral Bandwidth on the Working Curve in Vat Photopolymerization, Additive Manufacturing, 2024, 85, 104172.

T.J. Kolibaba, J.P. Killgore, B.W. Caplins, C.I. Higgins, U. Arp, C.C. Miller, D.L. Poster, Y. Zong, S. Broce, T. Wang, V. Talačka, J. Andersson, A. Davenport, M.A. Panzer, J.R. Tumbleston, J.M. Gonzalez, J. Huffstetler, B. R. Lund, K. Billerbeck, A.M. Clay, M.R. Fratarcangeli, H. J. Qi, D. H. Porcincula, L.B. Bezek, K. Kikuta, M.N. Pearlson, D.A. Walker, C.J. Long, E. Hasa, A. Aguire-Soto, A. Celis-Guzman, D.E. Backman, R. L. Sridhar, K.A. Cavicchi, R.J. Viereckl, E. Tong, C.J. Hansen, D. M. Shah, C. Kinane, A. Pena-Francesch, C. Antonini, R. Chaudhary, G. Muraca, Y. Bensouda, Y. Zhang, X. Zhao, Results of an

Interlaboratory Study on the Working Curve in Vat Photopolymerization, Additive Manufacturing, 2024, 84, 104082.

L.M.J. Moore, V.M.Q. Saludo, O.H. Grasdal, K.M. Smith, T.J. Kolibaba, J.C. Marcischak, J.P. Killgore, J.J. Snyder, G.R. Yandek, K.B. Ghiassi, Polybutadiene Click Chemistry: A Rapid and Direct Method for Vat Photopolymerization, ACS Applied Polymer Materials, 5, 9138.

C. Chandler, D.H. Porcincula, M.J. Ford, T.J. Kolibaba, B. Fein-Ashley, J. Brodsky, J.P. Killgore, A. Sellinger, Influence of Fluorescent Dopants on the Vat Photopolymerization of Acrylate-based Plastic Scintillators for Application in Neutron/Gamma Pulse Shape Discrimination, Additive Manufacturing, 2023, 73, 103688.

T.J. Kolibaba, E.T. Iverson, H. Legendre, C.I. Higgins, Z.N. Buck, T.S. Weeks, J.C. Grunlan, J.P. Killgore, Synergistic Fire Resistance of Nanobrick Wall Coated 3D Printed Photopolymer Lattices, ACS Applied Materials and Interfaces, 2023, 15, 16046.

T.J. Kolibaba, C.I. Higgins, N. C. Crawford, J. R. Samaniuk, J.P. Killgore, Sustainable Additive Manufacturing of Polyelectrolyte Photopolymer Complexes, Advanced Materials Technologies, 2023, 8, 2201681.

T.J. Kolibaba^, N.A. Vest, J.C. Grunlan, Polyelectrolyte Photopolymer Complexes for Flame Retardant Wood, Materials Chemistry Frontiers, 2022, 6, 1630.

T.J. Kolibaba, A. Nigam, B.L. Tai, J.C. Grunlan, Environmentally Benign Flame Retardant Polyamide-6 Filament for Additive Manufacturing, Macromolecular Materials and Engineering, 2021, 306, 2100245.

T.J. Kolibaba, C-C. Shih, S. Lazar, B.L. Tai, J.C. Grunlan, Self-Extinguishing Additive Manufacturing Filament from a Unique Combination of Polylactic Acid and a Polyelectrolyte Complex ACS Materials Letters 2020, 2, 15.

T.J. Kolibaba, J.C. Grunlan, Environmentally Benign Polyelectrolyte Complex That Renders Wood Flame Retardant and Mechanically Strengthened Macromolecular Materials and Engineering 2019, 304, 1900179.

Full list available via Google Scholar

Presentations

T.J. Kolibaba, Polyelectrolyte Complexes: From Coatings to Manufacturing, ACS Fall 2025, August 18-21. (Invited Talk)

T.J. Kolibaba, Vat Photopolymerization at the National Institute of Standards and Technology, University of Wyoming Department of Mechanical Engineering, November 21, 2024. (Invited talk)

T.J. Kolibaba, Controllable Properties and Functionality in Additive Manufacturing of Polyelectrolyte Photopolymer complexes, ACS Fall 2023, August 13-17. (Invited talk)

T.J. Kolibaba, Fire Testing and Flammability in Photopolymer Additive Manufacturing, PAMA Webinar, April 11, 2023.

T.J. Kolibaba, E.T. Iverson, H. Legendre, C.I. Higgins, Z.N. Buck, T.S. Weeks, J.C. Grunlan, J.P. Killgore,

Synergistic Fire Resistance of Nanobrick Wall Coated 3D Printed Photopolymer Lattices ACS Spring 2023, March 26-30.

Project Experience

Standards Leadership

Led two global interlaboratory studies while at the National Institute for Standards and Technology to standardize the working curve measurement in vat photopolymerization. Used data from these studies to develop a reference material to allow the field to validate their working curve measurements. This reference material was NIST's first (and to-date, only) reference material for additive manufacturing.

Novel Material Expertise

Trained Air Force Research Lab scientists in vat photopolymerization printing, assisted in optimization of printing parameters for polybutadiene-based 3D printing resin.

Commercial Impact

Led project to develop a flame retardant coating for a major plastic film company. Identified commercial material suppliers and optimized formulations to maintain high UL ratings for flame retardancy at minimal coat weight. Novel treatment outperforms previous industrial standard, coating commercially released Q4 of 2025.

Peer Reviews

Nature

Additive Manufacturing

Polymer Degradation and Stability

Macromolecules

ACS Macro Letters

ACS Applied Materials and Interfaces

ACS Applied Polymer Materials

Polymer Chemistry

RSC Applied Polymers