**YUE YUAN** yuany@ornl.gov

Macromolecular Nanomaterials,

Center for Nanophase Materials Sciences, Oak Ridge National Laboratory

1 Bethel Valley Road, Oak Ridge, TN 37831

**Education/Training:**

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| 2013  | B.E. | - Apparel Engineering, Wuhan Textile University, Hubei, China |
| 2016  | M.S.  | - Apparel and Textile Science, Kansas State University, Manhattan, KS - Affiliate Graduate Student at Nanotechnology Innovation Center of Kansas State (NICKS)  |
| 2021 | Ph.D. | - Fiber and Polymer Science, North Carolina State University, Raleigh, NC - Graduate minor in Biochemistry  |

**Research and Professional Experience:**

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| 11/2022-Now | **Distinguished Staff Fellow** at **Oak Ridge National Laboratory***Biobased polymeric nanomaterials and assembly and enzymatic synthesis*  |
| 03/2022-11/2022 | **Innovation Analyst** at **RTI International***Conducting primary and secondary research for innovation and opportunities in material and manufacturing sector.** Technology scouting and patent analysis
* Nano/micro encapsulation solutions; Additive manufacturing technologies; Food additives and processing; Functional polymeric materials for clean energy applications; Catalytic materials for water dechlorination/dechloramination.
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| 06/2021-03/2022 | **Postdoctoral Researcher** at **North Carolina State University***Biodegradable microencapsulation project (with Syngenta)* * Synthesis and modification of cellulose nanomaterials (CNC and CNF) from various cellulose sources.
* Developed biodegradable Pickering emulsion using cellulosic based chemistry regarding rheological, viscoelastic properties, interfacial tension of the formulation.
* Developed analytical characterization methods for renewable nanomaterials.
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| 08/2017-05/2021 | **Graduate Research Assistant** at **North Carolina State University***Flexible biocatalytic fibrous materials** Engineered enzyme immobilized (bio)polymeric fibrous matrices for reactive liquid-gas contactor and selective CO2 scrubbing. Studied the liquid transport inside the fibrous contactor with neutron imaging.
* Developed methods in evaluating the chemical and physical properties of the bioactive materials with enzyme immobilized (e.g., FTIR, ToF-SIMS, SEM).
* Developed assay for dissolved enzymes and bioactive materials.
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| 05/2019-08/2019 | **Graduate Intern** at **Oak Ridge National Laboratory***Production, deuteration and characterization of microbial chitosan* * Explored yeast and filamentous fungi cultivation and developing protocols for cell-wall polysaccharide extraction.
* Developed methods in characterizations of the chemical and physical of extracted chitosan with FTIR, light/X-ray scattering and NMR techniques.

Researched on the influence of cultivation conditions on the deuterium incorporation in the cell wall polysaccharide. |
| 01/2015-08/2017 | **Graduate Research Assistant** at **Kansas State University** *Fibrous drug delivery system* * Research on drug-polymer compatibility and drug release mechanism regarding the

hydrophobicity of the drug and polymers. * Developed biodegradable delivery system for sustained anti-cancer drug release.
* Developed methods for characterizing the drug distributions inside the polymeric matrix using electron microscopies (EM).

*Superhydrophobic surface fabrication, characterization, and its anti-bacterial property* * Developed novel superhydrophobic surface via nanofiber fabrication (electrospinning) and surface chemistry modification, such as vapor deposition.
* Characterized the structure and chemistry of superhydrophobic surfaces.
* Developed a solid-liquid contact area characterization method based on Cassie-Baxter model using fluorescent dye.
* Developed a test method of E. coli adhesion for anti-bacterial testing on surfaces with varied morphologies and hydrophobicity.
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**Awarded Proposal and Grant:**

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| 2023 | ORNL LDRD -Polyester enzymatic synthesis and screening method development, PI, $300K (2023.10-2024.9) |
| 2022 | ORNL LDRD-DSF, Functionality influenced renewable macromolecular nanomaterials reassembly, PI, $722.8K (2023.2-2026.2) |
| 2023 | CG-1D MARS General Proposal (IPTS-31550.1, awarded)Water-induced self-healing mechanism of biopolymeric fibers  |
| 2020 | Center for Nanophase Material Science General User Proposal (CNMS2020-B-00354, awarded) “NMR characterization of deuterium incorporated chitosan” |
| 2020 | American Association of Textile Chemists and Colorists (AATCC) Student Research Support Grant (awarded $1,200) “Continuous peroxide removal from post-process cotton bleaching and recycle water using catalase immobilized biocatalytic textile” |
| 2019 | CG-3 Bio-SANS Discretionary Time Proposal (IPTS-24404.1, awarded) “Structural analysis of a biopolymer matrix for a biocatalytic textile” |
| 2019 | CG-1D Neutron Imaging Proof-of-Principle Proposal (IPTS-24561.1, awarded) “Liquid transport in biocatalytic yarns” |

**Publication and Invited Talk**

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| **Patents** |
| S. Salmon and **Y. Yuan**. “Chitosan materials with entrapped enzyme and biocatalytic textiles and other biocatalytic materials comprising same.” US Patent No. 11,607,345 B2, 2023 (**Issued**) S. Salmon, J. Shen and **Y. Yuan**. “Textile gas-liquid-solid contactors and biocatalytic materials and methods comprising same. U.S. Patent Application Serial No. 63/197,584, 2021 (provisional)  |
| **Journal articles**  |
| T. Zhang, Y.Teng, Y. He, Y. Li, **Y. Yuan**, B. Li, Y. Chen, X. Zhu. Elucidate the molecular basis of ampholytic chitosan as a high-performance cryoprotectant to myosin denaturation: The importance of saccharide charges. Food Hydrocolloids, 109915 (2024)C. Wang, J. Rao, X. Li, D. He, T. Zhang, J. Xu, X. Chen, L.Wang, **Y. Yuan,** Xiangwei Zhu. Chickpea protein hydrolysate as a novel plant-based cryoprotectant in frozen surimi: Insights into protein structure integrity and gelling behaviors. Food Research International, 169, 112871 (2023)**Y. Yuan**, J. Shen, S. Salmon. Enzyme Immobilization with Fibrous Supports: Developing Versatility and Longevity, Membranes, 13, 5 (2023) C. Wang, J. Rao, X. Li, D. He, T. Zhang, J. Xu, X. Chen, L. Wang, **Y. Yuan**, X. Zhu, Chickpea protein hydrolysate as a novel plant-based cryoprotectant in frozen surimi: insights into protein structure integrity and gelling behaviors. Food Research International 169 (2023)J. Shen, **Y. Yuan**, S. Salmon. Durable and Versatile Immobilized Carbonic Anhydrase on Textile Structured Packing for CO2 Capture. Catalysts, 12, 10, 1108 (2022)S. Jung, S. Chang, N.E. Kim, S-O. Choi, Y-J. Song, **Y. Yuan**, J. Kim. Curcumin/Zeolitic Imidazolate Framework-8 Nanoparticle-Integrated Microneedles for pH-Responsive Treatment of Skin Disorders, ACS Applied Nano Materials, 5, 9, 13671-13679 (2022)J. Shen, **Y. Yuan**, S. Salmon. Carbonic anhydrase immobilized on textile structured packing using chitosan entrapment for CO2 capture, ACS Sustainable Chemistry & Engineering, 10, 23, 7772-7785 (2022)**Y. Yuan**, Y. Zhang, H. Bilheux and S. Salmon. Biocatalytic textile for peroxide decomposition with controlled liquid transport, Advanced Materials Interfaces, 8,7, 2002104 (2021) **Y. Yuan**, H. Li, W. Leite, Q. Zhang, P.V. Bonnesen, J. L. Labbé, K. L. Weiss, S. V. Pingali, K. Hong, V. S. Urban, S. Salmon and H. M. O’Neill., Biosynthesis and characterization of deuterated chitosan in filamentous fungus and yeast, Carbohydrate Polymers, 117637 (2021) X. Jiang, Y. Chen, **Y. Yuan**, L. Zheng, Thermal responses in cellulose Iβ based on molecular dynamics, Computational and Mathematical Biophysics, 7, 85-97 (2019) **Y. Yuan**, K. Choi, S-O. Choi, J. Kim, Early-stage release control of an anticancer drug by the drug-polymer miscibility in a hydrophobic fiber-based drug delivery system, RSC Advances, 8, 19791 – 19803 (2018) S.C. Park, **Y. Yuan**, K. Choi, S-O. Choi, J. Kim, Doxorubicin release controlled by induced phase separation and use of a co-solvent, Materials (Basel, Swizerland), 11, (2018) E. Brown, S.H. Park, A. Elangovan, **Y. Yuan**, J. Kim, X. S. Sun, X. Zhang, G. Wang, J. Li. Facilitating high-capacity V2O5 cathodes with stable two and three Li+ insertion using a hybrid membrane structure consisting of amorphous V2O5 shells coaxially deposited on electrospun carbon nanofibers, Electrochimica Acta, 269, 144-154 (2018). **Y. Yuan**, M. P. Hays, P. R. Hardwidge, J. Kim, Surface characteristics influencing bacterial adhesion to polymeric substrates, RSC Advances, 7, 14254-14261(2017) [**Citation>370**] **Y. Yuan**, S-O. Choi, J. Kim, Analysis of contact area between water and irregular fibrous surface for prediction of wettability, RSC Advances, 6, 73313-73322 (2016).  |
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| **Invited Talk****Y. Yuan**. Biodeuteration of polysaccharides from microorganisms. 2023 Neutron Scattering User Meeting, June 6-7, 2023, at Oak Ridge National Laboratory **Y. Yuan**. Biobased macromolecules and bioinspired nanomaterials. Graduate student seminar, School of Chemical and Biomolecular Engineering/School of Material Science and Engineering at Georgia Tech, April 2023**Y. Yuan**. Biodeuteration of polysaccharides and small angle neutron scattering. Current Trends in X-ray Scattering for the Study of Soft and Hard Materials Workshop at Georgia Tech, March 2023. |

**Volunteering Activities**

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| 2020.7-2021.6 | **Graduate Women in Science-Research Triangle Chapter- Collaboration coordinator** * Initiate fundraising for grant and scholarship in science community.
* Collaborate in mentoring programs for member
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| 2018-2020 | **STEM education volunteer at Stough elementary school (Wake County)** * Developing courses about "plastic waste and recycle”.
* Built network between school and local plastic recycle industry.
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| 2018.5 | **Triangle Women in Science (Research Triangle Park Area)** * Girls STEM Day at Duke University.
* Forensic badge associate for middle school NCCP Girl Scout.
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| 2016.9-2017.5  | **Sunset Zoo’s Science Communication Fellowship (Manhattan Area)** * Developed year-long science communication program for Manhattan community.
* Designed Hands-on projects in fiber science including wetting of textiles and special properties of nanofibers for elementary school and middle school students.
* Science communication for seniors (retired faculties) about emerging research in fibrous drug delivery system.
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**Honors and Awards**

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| 2022 | ORNL’s Top 10 Science Achievements at SNS and HFIR of 2022 |
| 2018 | Ellen Rohde Leadership Initiative Professional Development Grant ($1,243) |
| 2017 | 2016-2017 Science Communication Fellow (Manhattan, KS) |
| 2017 | Kansas State University Graduate Student Travel Grant ($750)  |
| 2016 | Textile Scholarship ($860)  |
| 2016 | Joseph H. Jones Scholarship ($700) |
| 2015 | “Olive J. Ubel Scholarship” ($700)  |
| 2013 | “Outstanding Graduates” of WTU (Awarded to Top 2% students)  |
| 2013 | Province “Outstanding Undergraduate Thesis” |
| 2011 | “National Scholarship” (¥8,000, awarded to Top 0.2% students). |
| 2011 | National “Textile Vision” Scholarship (¥5,000; awarded to Top 0.15% Textile/Apparel majors’ students) |