Zeyu (Alban) LI

Materials Scientist | Polymers & Hydrogels | 626-826-5327 | zl788@cornell.edu | zeyuli.net | Available May 2026

Materials scientist focused on polymer and biomaterials R&D, especially hydrogels and functional surfaces. Led a DoD-funded 11 km² field deployment of DNA-encapsulated polymer microparticle tracers, coupling particle fabrication with mechanical and environmental testing. Built an automated DNA feedstock extraction platform using perfluorocarbon pods that delivers approximately 200 mg DNA per pod and reduces material cost by about 91 percent, enabling scalable feedstock for DNA-derived materials. Developed 3D-printable self-healing DNA Al3+ hydrogel composites and durable superhydrophobic polymer coatings, supported by tensile, rheology and surface characterization; co-authored four publications and co-invented two patents.

SKILLS

Materials Characterization: SEM; DLS; EDS; Optical microscopy; UV–Vis spectroscopy; Fluorometry; Rheometry; Universal testing machine; Contact-angle measurement.

Fabrication & Processing: Electrospinning; 3D printing (DIW, SLA, FDM); Spin coating; Mold casting; Photolithography; Two-photon lithography; Etching; Nanopatterning; Freeze-drying; Roll-to-roll processing

Programming & Data/Modeling: Python; Data analysis & visualization (pandas, NumPy, seaborn); Machine learning (TensorFlow, PyTorch - working knowledge); Java; AI (vibe coding, agentic workflows, prompt engineering)

2D/3D Design & Visualization: CAD; SketchUp; Autodesk 3ds Max; Blender; KeyShot; Adobe Illustrator, Photoshop, InDesign; Bootstrap Studio; Scientific figure production; Video/audio editing.

Molecular & Bioengineering: PCR; qPCR; IVT; Electrophoresis (PAGE, agarose); DNA/RNA extraction & purification; LSPR-based binding assays; Bio-cleanroom protocols; Chromatography; Enzymatic assays and workflows.

EDUCATION

Cornell University — **Ithaca, NY**

Biological and Environmental Engineering

Concentration: Materials Science, Biological Engineering, Bioenvironmental Engineering

Ph.D. — DNA Materials Lab, Advisor: Dan Luo — Expected May 2026

M.S. — Aug 2024

M.Eng. — May 2020

Hong Kong Baptist University — **Kowloon, Hong Kong**

Chemistry (Major) and Computer Science (Minor)

B.Sc. (Hons) — Microfabrication & Surface Materials Lab, Supervisor: Kangning Ren — Nov 2019

EXPERIENCE

Graduate Research Assistant — **Ithaca, NY**

DNA Materials Lab, Cornell University — Feb 2021 - Present

- **Led a DoD-funded field trial of DNA-encapsulated polymer microparticle tracers** across 11 km² of lake, coordinating 4 disciplines and 7 research groups. Achieved qPCR detection 7 km downstream from <1 mg DNA release in a bio-cleanroom (first-author paper, ES&T, 2025).
- **Contributed to a continuous-flow nucleic acid production platform** (2nd author, Nature under review); co-designed and fabricated microfluidic chip reactors, performed all materials characterization (SEM, rheology), and developed a bead-based RNA purification method achieving up to 94% recovery.

- **Developed 3D-printable DNA hydrogels with three crosslinking modes**—thermal re-annealing, UV-reversible psoralen, and ionic (Al^{3+})—enabling time-programmed shape locking and repeatable self-healing. Integrated the Al^{3+} hydrogel as an adhesive into 3D-printed vascular ceramic tiles for autonomous structural repair (co-first-author paper, ACADIA, 2024).
- **Invented an automated DNA feedstock extraction platform** inspired by espresso machines, delivering ~200 mg DNA per pod and reducing production cost by ~91%.
- **Mentored 3 undergraduate researchers and taught across 7 engineering courses;** co-instructed one course (~50% of content, ~45 students) and integrated AI tools into teaching through guest lectures and LLM-based data analysis assignments.

Undergraduate Research Assistant & Senior Research Assistant **Kowloon, Hong Kong**

Hong Kong Baptist University Jun 2017 - Aug 2019 & Oct 2020 - Jan 2021

- **Engineered durable polymer superhydrophobic materials** by replicating nano-micro structures via thermal pressing with master molds from photolithography, two-photon lithography, and etching (3rd-author paper, The Innovation IF 33.2; US Patent 11,839,998).
- **Led an experimental study on static-charge anti-icing,** demonstrating ~25% reduction in droplet contact time. Received the Best Undergraduate Thesis Award.

Research Exchange Trainee **Atlanta, GA**

Georgia State University, Molecular Basis of Disease Program Jun 2018 - Aug 2018

- **Characterized protein–DNA binding kinetics** using LSPR (localized surface plasmon resonance) assays. Measured how transcription factor PU.1 interacts with DNA, providing insights into sequence-specific binding affinities in real time. Received the Best Poster Presentation Award for this work.

PUBLICATIONS

- Wang, D., *Li, Z.*, Li, J., Han, Y., Sun, T., Li, F., Liu, P. "A Chip Reactor for Perpetual Nucleic Acid Production and On-chip Information Processing." Nature, under review (2026).
- *Li, Z.*, Ramón, C. L., Koeberle, A., et al. "Tracing Environmental DNA Transport in Large Lakes with Synthetic DNA Microparticles and Hydrodynamic Modeling" Environmental Science & Technology (IF = 12.4), (2025). DOI
- He, C.*, *Li, Z.**, Wang, L. X., et al. "*PolyTile 4.0: Self-healing Ceramic Tiles*" ACADIA (2024). DOI
- Li, W., Chan, C. W., *Li, Z.*, et al. "*All-perfluoropolymer, nonlinear stability-assisted monolithic surface combines topology-specific superwettability with ultradurability.*" The Innovation (IF = 33.2), 4(2), 100299, (2023). DOI

PATENTS

- Ren, K., Wu, H., Wang, Z., Yao, S., Ong, B., Li, W., *Li, Z*., Sun, H., & Chan, C.W. "Crack engineering as a new route for the construction of arbitrary hierarchical architectures." US Patent 11,839,998, (2023).
- Li, Q., *Li, Z.*, & Lin, Z. "Reactor and method of spiral propulsion biomass continuous thermal cracking." Chinese Patent 201711214139.6 (2017).