Minghao Han

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EDUCATION

University of California, Riverside *Sept 2020 - Present*
Ph.D. in Chemical and Environmental Engineering
Advisor: Prof. Don R. Collins
GPA: 4.0/4.0

Southern University of Science and Technology *Sept 2016 - June 2020*
B.E. in Materials Science and Engineering
Advisors: Prof. Xiaodong Xiang
GPA: 3.8/4.0
Honors Thesis: *Development of a High-Performance Composite Heat Insulation Pipe*

TECHNICAL SKILLS

Systems Design & Integration
- Custom reactor and sampling system design (gas flow, thermal management, humidity and UV/oxidation environments)
- Fluid handling systems: pumps, mass flow controllers, valves, tubing, pressure regulation
- Multi-sensor integration for temperature, pressure, flow, gas, and particle measurements
- Data acquisition and control using NI-DAQ and LabVIEW; closed-loop control (PID, feedback logic)

Electrical & Controls
- Analog and digital I/O, power supplies, signal conditioning
- Electromechanical actuation and control, power and signal interfacing, safety interlocks, and fault monitoring
- Instrument communication

Mechanical Design & Fabrication
- CAD: SolidWorks, AutoCAD; rapid prototyping and 3D printing
- Specification of machined parts, tolerances, sealing, leak testing, pressure integrity
- Assembly of flow systems, enclosures, optical mounts, and sampling manifolds
- Precision mechanical and electrical fabrication, system assembly, and troubleshooting for custom experimental and prototype hardware

Automation & Software
- LabVIEW system automation and real-time control
- Python and MATLAB for instrument control, data pipelines, and time-synchronized acquisition
- Real-time monitoring, logging, and experiment management

Instrumentation and Experimental Systems
- Aerosol and particle instrumentation: AMS, OFR, SMPS, ELPI, CCNc, APS, CPC
- Gas and chemical analysis: GC-FID, trace-gas analyzers (NO_x, O_3, SO_2, ethylene oxide)
- Microscopy and bio: TEM, Nanoparticle Tracking Analysis (NanoSight), RT-qPCR

Scientific and Technical Communication
- Scientific and technical writing for peer-reviewed publications, technical reports, experimental protocols, and standard operating procedures (SOPs)

- Preparation of system documentation, flow diagrams, control logic descriptions, calibration and QA/QC records
- Presentation of technical results to interdisciplinary audiences (engineers, scientists, and non-specialists)

PROFESSIONAL CREDENTIALS AND CERTIFICATIONS

Engineer-in-Training (EIT), California
Envision Sustainability Professional (ENV SP), ISI
Certified SOLIDWORKS Professional (CSWP)

PROFESSIONAL AFFILIATIONS

National Society of Professional Engineers (NSPE)
Air & Waste Management Association (A&WMA)
American Society of Mechanical Engineers (ASME)
American Association for Aerosol Research (AAAR)

SELECTED AWARDS AND HONORS

Tau Beta Pi, National Engineering Honor Society
Salim Khan Graduate Award, UC Riverside *2025*
Student Travel Grant, American Association for Aerosol Research *2025*
William R. Pierson/Ford Graduate Award, UC Riverside *2024*
Esther F. Hays Graduate Fellowship, UC Riverside *2023*
Dean's Distinguished Fellowship, UC Riverside *2020*
Outstanding Student Award, SUSTech *2019*
Materials Microstructure Photography Award, SUSTech *2018*
Outstanding Student Social Practice Award (First Prize), Twice, SUSTech *2018*
Outstanding Freshman Scholarship, SUSTech *2016*

RESEARCH AND TECHNICAL EXPERIENCE

Applied Research and Field-Based Experimentation *2022 - Present*

Instrument Development: Advanced Mobile Oxidation Flow Reactor (OFR) System

- Designed and built a compact, field-deployable oxidation flow reactor with controlled temperature, relative humidity, ozone concentration, and UV intensity, achieving narrow residence-time distributions and reliable operation under rapidly changing field sampling conditions.

Field Campaign: Southern California Interactions of Low Clouds and Land Aerosol (SCILLA)

- Deployed and operated an OFR, cloud condensation nuclei counter (CCNc), and trace-gas analyzers onboard the Twin Otter research aircraft for in situ characterization of secondary aerosol formation processes and cloud-aerosol interactions.

Field Campaign: California Statewide Mobile Monitoring Initiative (SMMI)

- Led the build of a scanning mobility particle sizer (SMPS) and the operation of particle measurement instruments for a project team, including instrument calibration and post-campaign data analysis for statewide community-scale air quality monitoring.

Field Measurements: Drone-Based Ship Emissions Sampling

- Led the development, construction, and field deployment of a drone-based gaseous and particulate sampling system for ship exhaust plume measurements at the Ports of Los Angeles and Long Beach, including the development of data collection protocols.

Laboratory Studies: Secondary Organic Aerosol Formation from Vehicular Emissions

- Led laboratory studies of SOA formation from tire, brake, and exhaust emissions using an OFR-based setup; developed a condition-controlled sampling system for tire emissions; and applied a dynamometer-based platform to investigate brake emissions and fuel-dependent exhaust emissions.

Laboratory Study: Secondary Formation of Ethylene Oxide

- Contributed to experimental design and instrumentation modifications, and prepared experimental protocols for precursor and mixture studies and system calibration.

Foundational Research and Engineering Experience *2017 - 2022*

- Isolation and Identification of Emerging Environmental Pathogens of Vesicle-Cloaked Virus Clusters from Wastewater
- Development of photocatalytic electrospun nanofibrous membranes for capture and inactivation of coronavirus aerosols
- Development of a high-performance composite thermal insulation pipe
- Development of a high-throughput continuous melt-blending fiber fabrication system for multi-component materials
- Development of a lithium-ion power battery cooling system based on phase change materials

MENTORING AND TEACHING EXPERIENCE

Graduate & Undergraduate Mentoring — UC Riverside

Mentored 8 graduate and undergraduate students in experimental design, instrument operation, and data analysis for laboratory and field-based air quality research projects. Provided hands-on guidance in instrument calibration, troubleshooting, and data interpretation, and supervised junior researchers during field deployments and laboratory studies, emphasizing safe operation, data quality control, and reproducible workflows. *2022- Present*

Teaching Experience — UC Riverside

Teaching Assistant, Environmental Engineering Lab *Winter 2022*
Instructor: Prof. Yun Shen
Teaching Assistant, Catalytic Reaction Engineering *Spring 2021*
Instructor: Prof. Kandis L. Abdul-Aziz

PUBLICATIONS AND PATENTS

Peer-Reviewed Journal Articles

Cai, L., Han, S., **Han, M.**, Hazelwood, J., Collins, A., Petters, S., Meskhidce, N., Petters, M., Nucleation Mode Particle Emissions from Biosolid Processing Plants, *Environmental Science & Technology*.

Li, C., **Han, M.**, Gao, J., Wang, S., Lu, S.-B., Li, Y., Liu, Z., Zhang, C., Wang, Z., Wang, F., Sun, Y., Ho, C. L., Wang, K., Shen, Y., Li, K., Enhancing Photodynamic Inactivation via Tuning Spatial Constraint on Photosensitizers, *Science China Chemistry*, 67, 652-663 (2024).

Shen, H., **Han, M.**, Shen, Y., Shuai, D., Electrospun Nanofibrous Membranes for Controlling Airborne Viruses: Present Status, Standardization of Aerosol Filtration Tests, and Future Development, *ACS Environmental Au*, 2(4), 290-309 (2022).

Shen, H., Zhou, Z., Wang, H., Chen, J., Zhang, M., **Han, M.**, Shen, Y., Shuai, D., Photosensitized Electrospun Nanofibrous Filters for Capturing and Killing Airborne Coronaviruses under Visible Light Irradiation, *Environmental Science & Technology*, 56(7), 4295-4304 (2022).

Shen, H., Zhou, Z., Zhang, M., **Han, M.**, Durkin, D. P., Shuai, D., Shen, Y., Development of Electrospun Nanofibrous Filters for Controlling Coronavirus Aerosols, *Environmental Science & Technology Letters*, 8(7), 545-550 (2021).

Manuscripts in Preparation or Submission

Han, M., Velazquez, H., Jastermsky, E., Gomez, A., Zhang, Y., Cocker, D., Collins, D., Secondary Organic Aerosol Formation from Gaseous Tire Emissions: Laboratory Characterization and Real-World Implications, manuscript in preparation.

Han, M., Ries, B., Bahreini, R., Collins, D., Secondary Aerosol Formation Potential and Transport of Air Pollution off the Coast of Southern California, manuscript in preparation.

Han, M., Hurren, T., Collins, D., Karavalakis, G., Comparing Tailpipe Emissions and Secondary Aerosol Formation from Renewable Naphtha and Gasoline Blended with Ethanol, submitted to *Fuel*

Sun, Y., Zhang, H., **Han, M.**, Zhu, Y., Tang, X., Wu, H., Aw, T. G., Altan-Bonnet, N., Rose, J., Shuai, D., Shen, Y., Viruses Are Not "Lone Wolves": Discovery of Emerging Vesicle-Associated Viruses in Wastewater and Implications to Engineering Interventions, submitted to *Nature Water*.

Patents

Xiang, X., Lin, H., **Han, M.** *A Composite Structure Insulation Pipe and the Method for Using It*, China Patent CN112833278A, issued.