Engineering at Alberta

Department of Mechanical Engineering
University of Alberta Faculty of Engineering

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PhD Position Available – Evaluation of Photocatalytic Oxidation Technology for Microbial Inactivation

Mechanical Engineering

How to Apply

Interested candidates may contact **Dr. Lexuan Zhong** by email at lexuan.zhong@ualberta.ca to discuss their qualifications and the project. To apply for this opportunity, please submit a complete application package including a cover letter detailing your specific interest in this project, resume, and transcripts as soon as possible.

Position

Dr. Zhong of the Department of Mechanical Engineering at the University of Alberta invites applications and queries for a full-time PhD research assistant position in the area of **photocatalytic oxidation (PCO)-based air disinfection and microbial inactivation for building ventilation systems**.

Project

Airborne transmission of infectious microorganisms has become a critical concern for buildings, healthcare environments, schools, public facilities, and agricultural spaces. Photocatalytic oxidation technology has the potential to inactivate airborne microorganisms by combining light irradiation with photocatalyst materials to generate reactive species. However, its practical use in HVAC systems remains limited by insufficient knowledge of microbial inactivation mechanisms, reactor design, operational sensitivity, by-product formation, and standardized performance evaluation.

This project will experimentally and analytically evaluate PCO-based air purification technology for microbial inactivation under HVAC-relevant conditions. The research will investigate the effects of photocatalyst materials, light wavelength/intensity, airflow rate, relative humidity, residence time, microbial type, and system configuration on disinfection performance. The project will also assess potential secondary by-products and develop engineering metrics to support safe and effective design of PCO-based air treatment systems.

The expected outcomes include peer-reviewed journal publications, experimental datasets, performance models, and practical design recommendations for PCO-based microbial control in ventilation systems.

Specialized Training & Skill Development

The selected candidate will receive training in:

- HVAC and ventilation system design;
- Air purification and photocatalytic oxidation technologies;
- UV/light irradiation characterization;
- Bioaerosol generation, sampling, and measurement;
- Microbial inactivation experiments using safe surrogate organisms;
- Indoor air chemistry and by-product analysis;
- Experimental design and uncertainty analysis;
- Data analysis, modeling, and scientific writing.

Required Qualifications

- MSc degree in Mechanical Engineering, Environmental Engineering, Civil Engineering, Chemical Engineering, Building Engineering, Microbiology, or a closely related field;
- Strong academic record, normally with a minimum GPA of 3.5/4.0 or equivalent;
- Strong motivation to conduct publishable research;
- Ability to work independently and systematically;
- Strong interest in indoor air quality, air disinfection, HVAC systems, or environmental technologies;
- Excellent written and verbal communication skills in English;
- Willingness to read literature deeply and prepare journal manuscripts.

Desired Qualifications

- Experience with photocatalysis, TiO_2-based materials, UV systems, or advanced oxidation processes;
- Experience with microbiology, bioaerosol sampling, microbial culture, or safe biological surrogates;
- Experience with HVAC systems, duct experiments, aerosol measurement, or indoor air quality testing;
- Knowledge of VOCs, ozone, aldehydes, or indoor air chemistry;
- Experience with experimental design, statistical analysis, or uncertainty analysis;
- Strong data analysis skills using MATLAB, Python, R, or similar tools;
- Prior publication, thesis, or research project experience.

Start Date
Fall 2026 or Winter 2027

Funding Availability
Funding is available for a highly qualified candidate.

How to apply
Interested candidates may contact Dr. Lexuan Zhong at lexuan.zhong@ualberta.ca with a complete application package, including:

- Cover letter describing specific interest in this project;
- CV/resume;
- Academic transcripts;
- Any publications, thesis, or research writing sample, if available.

Research Website
For more information, please visit: https://sites.ualberta.ca/~lexuan1/