LUND UNIVERSITY | LTH FACULTY OF ENGINEERING

Suggested master degree work within the LTH Profile Area Aerosols 2026

Updated 27 March 2026

Department of Design Sciences

Degree Project in Aerosol Technology, MAMM05, 30 credits

Oxidative Potential of Non-Exhaust Traffic Emissions: Focus on Brake, Tire, and Road Wear

Contact persons: Vilhelm Malmborg, vilhelm.malmborg@design.lth.se / Sara Bengtsdotter, sara.bengtsdotter@design.lth.se

Project description: With the upcoming integration of Oxidative Potential (OP) into EU air quality monitoring, understanding its sources is more critical than ever. This master's thesis project will focus on a key area of concern: Non-Exhaust Emissions (NEE) from traffic. As traditional exhaust emissions decrease due to technology and electrification, wear particles from brakes, tires, and roads, as well as resuspended road dust, are increasingly recognized as significant sources of air pollution and potentially major contributors to ambient OP. In this project, you will perform a comprehensive assessment of non-exhaust particles Oxidative Potential (OP) and the production of related Reactive Oxygen Species (ROS) using established and potentially novel methodologies. We are looking for a student with a background in chemistry, physics, environmental science, or a related

field and a strong interest in air pollution, its health effects, and policy.

Long-range transport of airborne polycyclic aromatic compounds to Southern Sweden

Contact person: Axel Eriksson, axel.eriksson@design.lth.se

Project description: We seek highly motivated students (number of students and extent of work [ECTS] is flexible) to help us finalize a publication on polycyclic aromatic hydrocarbons (PAHs) in regional background air. PAHs, particularly their oxygenated derivatives (OPAHs), are regarded as important organic particle constituents driving adverse health effects including cancer. We have >100 particle samples, each from 3-day collection at our local regional background site, already analyzed (using mass spectrometry) covering 45 PAHs and 10 OPAHs, which is a unique dataset. This quantitative PAH/OPAH data will in the project be compared with air mass back trajectories to establish a source-receptor relationship using the HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory) model using an already developed MATLAB tool (MATLAB experience is hence a strong merit for prospective students), possibly supplemented by multivariate statistical analysis (Positive Matrix Factorization, PMF) given sufficient bandwidth. In addition to determining where the PAH we breathe comes from, the project could, if successful, help shine light on the transformation of PAH into even more toxic OPAH which may or may not be driven by atmospheric processes.

External partners: Dr Adam Kristensson and Dr Erik Ahlberg, ACTRIS Sweden | ACTRIS Sweden. Dr Ioannis Sadiktsis, Department of Chemistry, Stockholm University.

Real-time measurement of Reactive Oxygen Species on insoluble particles

Contact person: Jonas Enarsson, jonas.enarsson@design.lth.se

Project description: Reactive oxygen species (ROS) are a group of free radicals which can be either present on the surface of particles or generated through chemical reactions between particles and cells. Exposure to particle-induced ROS is considered the main toxicity mechanism responsible for the adverse health effects associated with inhalation of airborne particles. In the Aerosol Laboratory, we have built an instrument which can assess ROS on particles in real-time, for screening of particle toxicity. We are looking for two students who can use this instrument to assess ROS from various particle sources, generated in our chamber in the Aerosol Laboratory. Part of the project will be focused on a method of correcting for artefacts previously observed while sampling insoluble particles, e.g. soot from candle smoke.

Department of Physics

Degree Project in Physics, PHYM01, 30 credits

Aerosol sources in the Arctic

Contact person: Pontus Roldin, pontus.roldin@fysik.lu.se

Project description: In this project you will study the sources of aerosol particles in the Arctic. You will learn to run an atmospheric chemistry transport model. The results from the model will be combined with aerosol particle observations from icebreaker expeditions and research stations in the Arctic. The aim is to get a better understanding of how natural and anthropogenic emissions of gases and particles influence the aerosol particle concentrations and cloud droplet number concentrations in the Arctic. It may also be possible to perform an aerosol observation field campaign on the Faroe Islands.

External partner: Sigurd Christiansen, The University of the Faroe Islands

Department of Mechanical Engineering Sciences

Degree Project in Machine Elements, MMEM01

(Civilingenjörsexamensarbete)

Evaluation of brake emissions using a dynamic brake testing protocol

Contact person: Jens Wahlström, jens.wahlstrom@lth.lu.se

Project description: This is an experiment-based project where the students can get hands on experience on testing brake components from heavy duty vehicles. In this project, the students will have opportunities to evaluate brake particle emissions from innovative and traditional brake materials from worldwide leading brake part supplier. Airborne particles concentration and size distribution will be measured with advanced particle spectrometers. The particles will be collected using a cascade impactor for single particle characterization using scanning electron microscope (SEM) and chemical composition analysis using inductively coupled plasma mass spectrometry (ICP-MS). The purpose of the project is to lower the brake particle emissions from heavy duty vehicles, promoting a more sustainable transport and society.

Department of Chemistry

15 or 30 credits

Liquid Crystal Monomers (LCMs) in household dust

Contact person: Annette Krais, annette.krais@chem.lu.se

Project description: Liquid crystal display screens can release many organic pollutants into the environment, including liquid crystal monomers (LCMs). LCMs have been proposed as a novel class of chemicals of concern, emerging as persistent, bioaccumulative, and toxic organic pollutants. In this project, we aim to detect LCMs in indoor dust from several homes in Sweden. Liquid chromatography coupled to mass spectrometry will be used to measure several known LCMs.

Wartime air pollution and asthma

Contact person: Annette Krais, annette.krais@chem.lu.se

Project description: Wartime military action in Ukraine is causing cause incredibly high environmental pollution with e.g. high levels of airborne particulate matter (PM), toxic gases and heavy metals. In this project, we plan to analyse monitoring data from air monitoring sensors around Lviv and Polish measurement stations close to the Ukrainian border. Results will be compared with current patient data on asthma occurrence as well as historical data from the last years. We expect from this study insights in particle pollution from warfare, that will help us prepare for potentially upcoming challenges in Sweden in the future.

External partner: financed by LU development office, supporting Ukrainian researchers: https://www.linkedin.com/company/development-office-lunds-universitet/posts/