



2027 Summer Research Project

Section	Description
Project title	Improving Sample Clean-Up for Passive Sampling of Environmental Chemicals
Hours & delivery	36 hours per week, Dutton Park. Working days/hours can be discussed with the successful applicants.
About the project (150–250 words)	Passive samplers are increasingly used to measure environmental contaminants because they can accumulate chemicals from water over time, providing an integrated measure of chemical exposure. However, extracting chemicals from passive samplers can also extract other material from the sample matrix. This matrix can interfere with chemical analysis, potentially affecting analytical performance and the reliability of measured concentrations. The current extraction procedure for our MPT passive samplers produces extracts containing a substantial amount of matrix and does not currently include a washing or clean-up step. In analytical chemistry, washing steps are commonly used during solid-phase extraction (SPE) to remove unwanted matrix components while retaining compounds of interest. Introducing an appropriate washing step could therefore improve the cleanliness of passive sampler extracts, but it is important to establish that target chemicals are not lost during the process. This project will investigate whether an additional washing step can improve the sample preparation procedure for MPT passive samplers. Students will test selected washing conditions using controlled laboratory samples and compare the resulting extracts in terms of matrix removal, chemical recovery and reproducibility. The results will contribute to improving the reliability and robustness of passive sampler analysis for environmental monitoring.
What you'll do (100–150 words)	You will first receive training in accurate pipetting, preparation of solutions and standards, and the principles of passive sampling. They will then prepare controlled samples containing representative target chemicals and perform the existing MPT passive sampler extraction procedure. You will investigate different washing conditions and compare them with the current procedure, which does not include a washing step. This will involve preparing replicate samples, performing extraction and clean-up procedures, preparing samples for instrumental analysis, and implementing appropriate blanks and quality-control samples. You also will analyse and compare chemical recovery and matrix-related effects between the different conditions. They will maintain detailed laboratory records, process the resulting data and use graphs and basic statistical approaches to determine which conditions provide the best balance between matrix removal and analyte recovery.
What you'll learn (100–150 words)	You will gain practical experience in analytical and environmental chemistry, including sample preparation, solvent handling, pipetting, preparation of standards, solid-phase extraction principles and laboratory quality assurance and quality control.



	You will learn how an analytical method can be systematically tested and improved rather than simply applied. In particular, students will investigate the trade-off between removing unwanted matrix and retaining chemicals of interest. You will also gain experience preparing samples for instrumental analysis, interpreting analytical data, assessing recovery and reproducibility, and identifying potential sources of uncertainty. They will develop skills in experimental planning, laboratory documentation, data processing, scientific interpretation and communicating research findings.
Project outcomes (75–125 words)	By the end of the project, you will have experimentally evaluated whether incorporating a washing step improves the extraction and analysis of chemicals from MPT passive samplers. The project will produce a comparison of the current extraction procedure with selected washing conditions, including measurements of chemical recovery, matrix-related effects and reproducibility. Students will identify the most promising washing condition(s) and provide recommendations for further method development. The results will contribute to ongoing research aimed at improving the reliability of passive sampler measurements and may provide the basis for incorporating an improved clean-up step into the laboratory's standard operating procedure.
Who should apply? (75–125 words)	This project would suit undergraduate students studying chemistry, environmental science, environmental engineering, biochemistry, pharmaceutical science or a related discipline who are interested in analytical chemistry and environmental research. Previous laboratory experience is helpful but not required. The project is particularly suited to students who are curious about how laboratory methods are developed and validated, enjoy practical experimental work and are comfortable following detailed procedures. Applicants should be willing to learn new laboratory techniques, work carefully and consistently, maintain accurate records and troubleshoot experimental problems. An interest in environmental contaminants, analytical chemistry, instrumentation or environmental monitoring would be advantageous.
Team & supervision (75–125 words)	You will work within a research environment focused on environmental contaminants, chemical exposure and passive sampling. They will receive hands-on training and regular supervision throughout the six-week project, with laboratory activities conducted alongside researchers experienced in passive sampling, sample preparation and instrumental chemical analysis. The project will be supervised by Dr Rory Verhagen and the student will work with members of the research group during laboratory activities and data analysis.
Additional opportunities (optional)	N/A
Additional requirements (if applicable)	If the project involves working with passive samplers that have been deployed in wastewater, students will be required to have appropriate vaccinations, including Hepatitis A, Hepatitis B and tetanus, in accordance with laboratory safety requirements. Vaccination is preferred as it will allow students to work with real environmental samples. However, vaccination is not a prerequisite for applying. If students do not have the required vaccinations, the project can be conducted using laboratory-prepared, spiked



passive samplers instead. The final experimental approach will be discussed with the successful applicants and will depend on the available samples and project requirements.

Contact

Yes students may contact the supervisor before applying rory.verhagen@uq.edu.au
