

Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2022-06
Project Title:	Environment and Conservation Fund - Removal/Recovery of Phosphorus from Water by Using La ₂ (CO ₃) ₃ -Loaded Anion Exchange Resin in a Semi-fluidized Bed Reactor
Principal Investigator:	Professor Lo Irene Man Chi, Department of Civil and Environmental Engineering, The Hong Kong University of Science and Technology
Total Approved Grant:	\$496,000
Duration:	3/7/2023 to 2/7/2025
Project Status/Remarks:	On-going
Project Scope:	<p>Phosphorus, a non-renewable nutrient, is continuously discharged into water bodies through human activities. Excessive phosphorus accumulation in surface water causes eutrophication, damaging aquatic ecosystems and can affect drinking water quality in Hong Kong. Adsorption is a low-cost, simple, and highly efficient process for capturing phosphate. However, most adsorption studies consider laboratory-scale batch experiments, which could not provide process parameters for flow reactors in practical application. Recently, fixed bed column studies have been employed to study the adsorption performance in a continuous flow system. However, this type of reactor suffers from channelling and pressure drop issues. Furthermore, the lack of process optimisation approach and modelling studies leads to the inability to accurately predict phosphorus removal performance in preparation for any opportunity for future scale-up.</p> <p>Herein, the project team proposes developing a novel semi-fluidised bed reactor for efficient phosphorus removal/recovery using lanthanum carbonate (La₂(CO₃)₃)-loaded anion exchange resin. This study will first characterise the adsorbent and then study its performance in the semi-fluidised bed reactor. The optimisation will be achieved with response surface methodology (RSM) and its axial dispersion and liquid-to-solid mass transfer coefficients will be estimated by real-time dynamic modelling. Overall, the research findings can provide parameters for process scaling-up in future industrial applications.</p>
Summary of the Findings/ Outcomes:	To be available upon completion of the project