Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2020-46
Project Title:	Comparative study on subcritical hydrothermal treatment as pre- and post-treatment of anaerobic digestion - Opportunities for the improvement of food waste treatment technology in Hong Kong
Principal Investigator:	Dr Zhao Jun, Institute of Bioresource and Agriculture, Hong Kong Baptist University
Total Approved Grant:	$497,200
Duration:	1/6/2021 to 31/5/2023
Project Status/Remarks:	Completed
Project Scope:	This project aims to combine hydrothermal treatment technology with anaerobic digestion of food waste to improve treatment efficiency and biogas production, and to convert solid digestate into high-quality hydrochar with comparable properties with activated carbon. The specific goals are as follows – (a). Apply subcritical hydrothermal hydrolysis technology as the pre-treatment of food waste to improve the efficiency of anaerobic digestion and the production of biogas; (b). Use subcritical hydrothermal carbonisation technology to convert solid residue from anaerobic digestion into high-quality hydrochar; and (c). Recycle and reuse the process water from hydrothermal carbonisation in food waste anaerobic digestion to promote biogas production.
Summary of the Findings/Outcomes:	This project showcased the successful use of hydrothermal technology in both pre-treatment and posttreatment stages of anaerobic digestion for food waste. By employing hydrothermal technology, significant improvements have been achieved in the efficiency of anaerobic digestion, resulting in increased biogas production. The pre-treatment of food waste using hydrothermal technology brought about physical and chemical changes that made the food waste more suitable for microbial decomposition and utilization, resulting in enhanced biogas production. Additionally, the project addressed the challenge of treating the residue from anaerobic digestion by producing high-quality hydrochar from solid digestate. The digestate-derived hydrochar and hydrothermal processing liquid can be used as additive to the food waste anaerobic digestion and showed significant promotion effect for biogas generation. Moreover, the addition of hydrochar aided in the dewatering of residual materials after anaerobic digestion. Furthermore, the project modified the digestate-derived hydrochar, enhancing its physicochemical properties and demonstrating excellent pollutant adsorption capabilities in wastewater treatment. Through a techno-economic analysis, it is evident that adopting hydrothermal technology in the anaerobic digestion process is economically advantageous. The improved biogas production efficiency enhances profitability and resource utilization. The findings have the

	potential to significantly contribute to the development of sustainable waste management systems and promote a transition towards a more environmentally friendly and economically viable future.