Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2021-104
Project Title:	Recycling yard waste into new-generation biochar adsorbents for CO_2 and VOCs removal
Principal Investigator:	Professor Tsang Chiu Wa Daniel, Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University. With effect from 21 August 2023, replaced by Dr. Leung Yai Fai, Andy, Department of Civil and Environmental Engineering, The Hong Kong Polytechnic University.
Total Approved Grant:	$1,179,557
Duration:	1/3/2022 to 31/8/2023
Project Status/Remarks:	Completed
Project Scope:	There are currently large quantities of yard waste that should be diverted from landfill disposal in Hong Kong. This project will develop an innovative solution to recycle Hong Kong's yard waste into new-generation engineered biochar as high-performance adsorbents for CO_2 and VOCs removal. In this project, the project team will– (1). innovate the engineering process designs and customise the operating conditions for manufacturing biochar adsorbents from Hong Kong's yard waste; (2). fully characterise the physicochemical properties of biochar adsorbents and evaluate against the guidelines of International Biochar Initiative (IBI) and European Biochar Certificate (EBC); (3). evaluate the efficacy of different engineered biochar products as high-performance adsorbents for CO_2 and VOCs removal (non-polar/polar VOCs such as benzene, toluene, xylene, and acetone) through pressure swing adsorption, column breakthrough, and pilot-scale chamber in laboratory and EcoPark; (4). compare the prototype of biochar adsorbents with commercially available adsorbents (such as activated carbon and zeolite) and validate the environmental merits by means of life cycle assessment (LCA). This project will boost local recycling business for sustainable yard waste management and promote circular economy in Hong Kong.
Summary of the Findings/Outcomes:	The massive generation of local yard waste and high industrial emission of greenhouse gases and volatile organic compounds have become major environmental concerns in Hong Kong nowadays. This project upcycles the local yard waste into an efficient adsorbent for greenhouse gases and volatile organic compounds removal. Based on our science-informed design and customization, the produced engineered biochar can effectively adsorb the CO2 and VOCs, with potential environmental and economic benefits. We provide a promising approach to local waste treatment and offer valuable insights and technical support for local waste utilization, contributing to waste recycling, energy saving, pollutants reduction, and

	thus, a sustainable future.