

Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2022-26
Project Title:	Environment and Conservation Fund - CO ₂ and CH ₄ Conversion into High-Value Liquid Chemicals and Fuels in One Step at Room Temperature by Sliding Arc Plasma-Catalyst Synergy
Principal Investigator:	Professor Du Yaping, Department of Building Environment and Energy Engineering, The Hong Kong Polytechnic University
Total Approved Grant:	\$500,000
Duration:	1/7/2023 to 30/6/2025
Project Status/Remarks:	On-going
Project Scope:	The resourceful use of carbon dioxide (CO ₂) is vital to achieving carbon neutrality in Hong Kong by 2050 and will create a carbon-cycle economy thereafter. The purpose of this project is to demonstrate in the laboratory that sliding arcs can work with catalysts to reform CO ₂ and CH ₄ into high-value liquid chemicals and fuels in one step at room temperature. This goal is achieved mainly through the design of a novel reactor that generates a tornado-like flow, allowing the arc to slide and disperse and then pass through a ceramic honeycomb carrier coated with catalysts. This design can solve the current problems with the synergy between the sliding arc plasma and the catalyst, e.g., the arc plasma can deactivate the catalyst by acting directly on it, and the active ingredients produced by the arc discharge do not make effective contact with the catalyst. Furthermore, experiments are carried out to investigate the influence of factors such as driving voltage, ratio and flow rate of the reactant gases on the reactor performance. The project findings will further advance the application of plasma-driven catalysts in the field of CO ₂ resource utilisation.
Summary of the Findings/ Outcomes:	To be available upon completion of the project