# Environmental Research, Technology Demonstration and Conference Project

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| **ECF Project:** | ECF 2022-33 |
| **Project Title:** | Environment and Conservation Fund - Process intensification reinforces the carbon-free ammonia-to-hydrogen efficiency through microwave heating |
| **Principal Investigator:** | Dr Li Meng-Jung, Department of Applied Physics, The Hong Kong Polytechnic University |
| **Total Approved Grant:** | $500,000 |
| **Duration:** | 1/4/2024 to 31/3/2026 |
| **Project Status/Remarks:** | To be commenced |
| **Project Scope:** | This project aims to address the critical technical barrier in the hydrogen supply section of fuel cells for mobile applications. Liquid hydrogen carriers such as ammonia enable safe and efficient hydrogen transport under mild conditions. However, the main downside is that the ammonia-to-hydrogen thermochemical process suffers from slow and energy-inefficient startup time, and often with significant investment and operational costs, thus limiting its industrial, mobility, and energy end users. The project proposes to reinforce hydrogen production from ammonia with microwave-assisted heating technology. In this project, firstly, a microwave heating prototype for ammonia decomposition reaction will be configured and optimised. Secondly, supported Ru-bifunctional catalysts will be developed to achieve high ammonia-to-hydrogen activity and microwave-absorbing properties with a systematic investigation of the structural and electronic features. Finally, the optimal bifunctional catalysts and system parameters will be identified to establish a fast-activated and energy-efficient zero-carbon hydrogen production process. Overall, this project is designed to overcome the slow-heating limitations in ammonia cracking technology to facilitate a practical and commercially viable ammonia-to-hydrogen energy solution. The project goal matches Hong Kong's carbon neutrality target and aligns with the decarbonisation strategies to facilitate an energy transition toward a zero-emission society. |
| **Summary of the Findings/ Outcomes:** | To be available upon completion of the project |