

# IGFC關鍵材料/製程/零組件及二氧化碳再利用之技術開發

執行單位

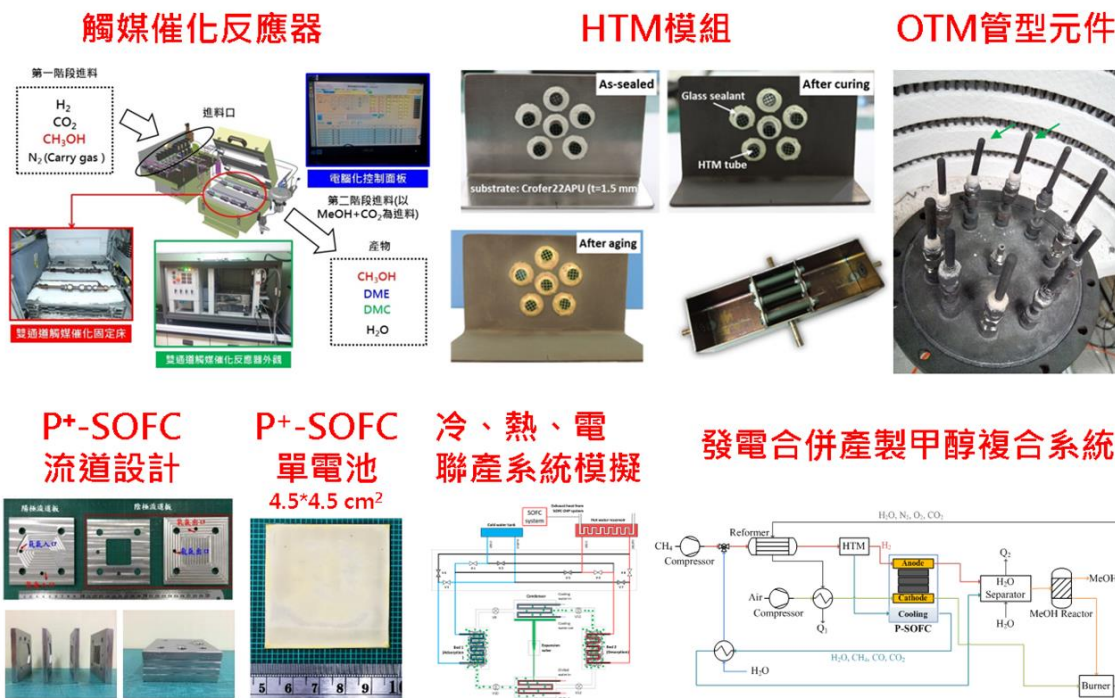
國立中央大學

計畫主持人

林景崎教授

- 本計畫開發之技術整合為HTMR實體模組、ASU/OTM實體模組、SOFC實體系統、IGFC暨CO<sub>2</sub>再利用系統模擬等四大主題，可整合應用於IGFC系統，也可依特定工業之所需，將各主題進行彈性局部整合，以獲得最大的經濟效益。

執行期間合計專利獲證共8件，包含HTM與SOFC陶瓷材料及製程相關專利4件、SOFC系統用乙醇重組觸媒相關專利1件、轉化觸媒生產MeOH/DME/DMC技術相關專利2件、SOFC併產甲醇複合系統設計相關專利1件。



- 本計畫聚焦在IGFC系統亟需開發之關鍵材料/製程/零組件及二氧化碳再利用技術，透過所開發的HTM與OTM/ASU系統針對合成氣(syngas)進行氣體分離，以提供化學轉化系統產生甲醇/二甲醚/碳酸二甲酯等新一代能源產品及SOFC電化學系統產生電力，為提高IGFC整體效能，同時利用分析及模擬對IGFC系統進行規劃，並針對各元件進行封裝與測試，以期將各個元件在系統進行適當整合，發展高效率之潔淨能源IGFC系統。
- 本計畫所發展之關鍵技術可使前端氣化(Gasification)與氣體淨化(Gas cleanup)所產生的合成氣及二氧化碳，得以用於提升發電效率及生產能源產品，使IGFC之應用及整合更加廣泛及完整。計畫之執行成果將有助於建立國內IGFC系統的技術能量，以促進減碳淨煤主軸計畫效益之加成，同時培養關鍵技術及系統人才投入產業，協助提升我國下世代能源產業之發展。

# Development and design of materials, components and fabrication processes in IGFC for the utilization of CO<sub>2</sub> and syngas

Execution Unit

National Central University

Project Director

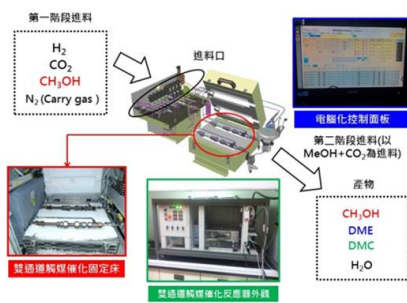
Prof. Jing-Chie Lin

- The goal of this project is to develop a compact and highly efficient IGFC system, which can effectively utilize the syngas to reduce the industrial carbon emission.

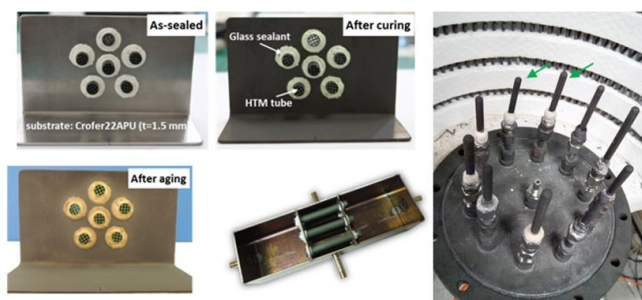
## Approved Patents:

- Fabrication of HTM and SOFC materials (4 patents)
- Ethanol reforming catalyst composition and method (1 patent)
- MeOH/DME/DMC catalyst (2 patents)
- SOFC and MeOH complex system (1 patent).

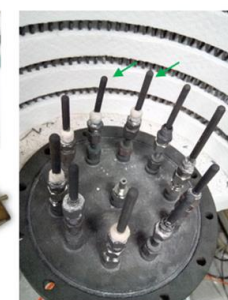
### DME/DMC/MeOH Reactor



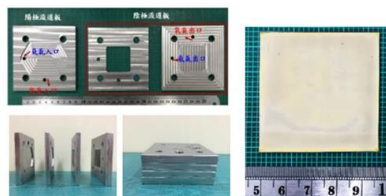
### HTM module



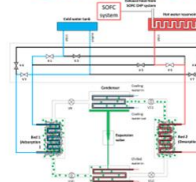
### OTM module



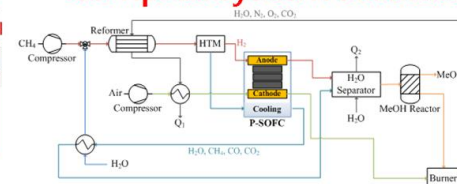
### P<sup>+</sup>-SOFC single cell



### Tri-gen system simulation



### SOFC-DME/DMC/MeOH Complex system simulation



- This project focuses on the development and design of key components in the IGFC (Integrated Gasification Fuel Cell) system.
- The HTM (hydrogen transport membrane) and OTM/ASU (oxygen transport membrane/air separation unit) are aimed for the separation and purification of syngas or air derived from gasification and cleanup processes. The separated/purified gases ( $O_2$ ,  $H_2$ ,  $CO/CO_2$ , etc.) then can be fed into either chemical conversion reactors or SOFC systems to synthesize different energy products (methanol/DME/DMC) and generate electrical power, respectively. The overall performance and efficiency of the IGFC systems is analyzed by simulation.
- The ultimate goal of this project is to develop a compact and highly efficient IGFC system, which can effectively utilize the syngas to reduce the industrial carbon emission.