

先進中高溫二氧化碳捕獲及分離系統技術開發

執行單位

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計畫主持人

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- 結合除塵、脫硫、脫硝等氣體淨化技術，應用於國內使用燃油或燃氣之小型鍋爐之廠商，有效降低溫室氣體與其他有害物質排放；並可協助廠商回收可用燃氣進行轉化，增加能源資源使用效率與提高產品附加價值。

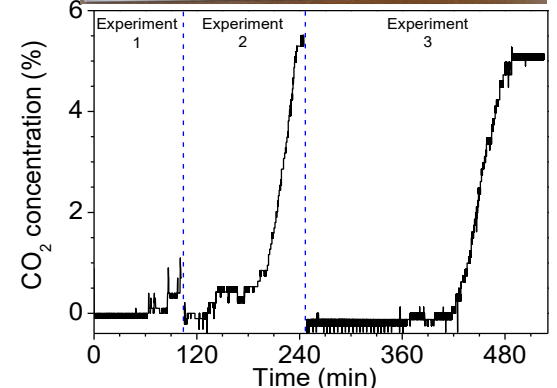
1. 申請中華民國專利：「彈性操作分離氫氣的裝置與方法。」(申請號：105113699)
2. 申請中華民國專利：「供鈣鋁碳酸鹽捕碳劑使用的四軸向鰭片固定床反應器。」(申請號：105122504)
3. 申請中華民國專利：「中高溫捕碳劑及其製造方法。」(申請號：105111878)



左上：成功設置「CO₂捕獲測試平台」於潔鼎公司並進行現地測試；

右上：「CO₂捕獲測試平台」展示示意模型；

右下：CO₂捕獲批次現地測試結果，CO₂移除率大於90%。



- 本計畫包含中高溫(300~500 °C)水氣轉移及甲烷化觸媒開發、中高溫薄膜氣體分離、中高溫CO₂捕獲材料開發及系統與程序整合設計。目標為發展適用於中高溫之CO₂移除、氣體重組與分離之技術。
- 成功合成較商用觸媒適合應用於高溫WGS反應之Pt-Ni觸媒；完成薄膜WGS反應器之原型，可用以進行WGS反應及H₂與CO₂之分離。
- 已成功設置「CO₂捕獲測試平台」於潔鼎公司廢塑膠裂解工廠現址，並批次進行數次現地燃燒尾氣CO₂捕獲試驗。500 °C下，CO₂移除率大於90%，H₂S、SO_x殘留量小於10 ppm。已驗證技術可行性，可做為後續大型測試與驗證系統之設計依據，有助於協助國內產業建立關鍵技術。
- 本計畫所屬之專利「奈米層狀碳酸鹽之中高溫捕碳劑」榮獲2012年台北國際發明暨技術交易展競賽組銀牌獎。

Development of advanced system for warm-gas CO₂ capture and separation technology

Execution Unit

Institute of Nuclear Energy Research

Project Director

Dr. Ching-Tsung Yu

- This project integrated dust removing, desulfurization/denitration, CO₂ capture, reforming and separation technologies, which can be applied to domestic manufacturers using small oil-fired and gas-fired boilers, decreasing emission of greenhouse gas and other harmful materials. If it was applied to cracking furnaces, it can also recycle the valuable gas and reform it to high-value products.

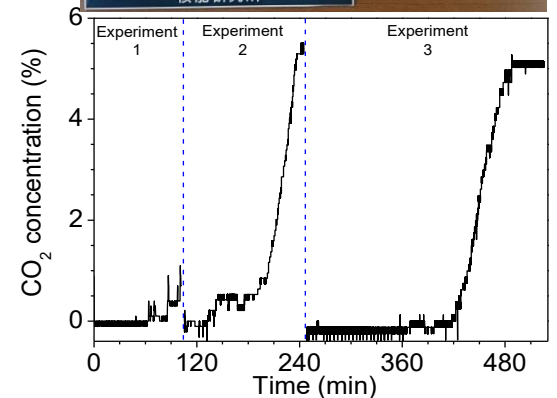
1. Application for the R.O.C Patent: "Flexible Device and Method for Separation of Hydrogen" (Application No.: 105113699)
2. Application for the R.O.C patent: "Four-Axis-Fins Fixed Bed Reactor for use with calcium aluminate carbonates CO₂ sorbents" (Application No.: 105122504)
3. Application for the R. O. C. Patent: "High temperature carbon capture agent and its manufacturing method." (Application No.: 105111878)



Top left: A "CO₂ capture test platform" set up and operated for a in-situ test at Advance Hitech & Science Company.

Top right: "CO₂ Capture Test Platform" display model.

Bottom right: CO₂ capture in-situ batch test results with CO₂ removal ratio greater than 90%.



- This project included water gas shift (WGS) reaction, gas separation by thin film, CO₂ capture sorbents and system integration design. The aim is to develop CO₂ removal, gas reforming and separation technologies suitable for medium-high (300~500 °C) temperature.
- The project has several achievements including the successful synthesis of Pt-Ni catalyst for high temperature WGS reaction and prototype design of WGS thin-film module for H₂ purification.
- Additionally, the "CO₂ capture test platform" has been successfully set up at the current site of waste plastics cracking plant of Advance Hitech & Science Company. Several CO₂ capture performance tests have been evaluated. At 500 °C, CO₂ removal was greater than 90%, and both H₂S and SO_x residues were less than 10 ppm. The results can be used as a basis for the design of subsequent large-scale test and verification systems to assist in the establishment of the key technologies in the domestic industry.
- The patent in this project: "Method of fabricating layered nano-carbonate used for medium-high temperature CO₂ sorbent" won Silver Award for "Taipei Int'l Invention Show & Technomart."