

水電解產氫及其加氫系統之模擬研究

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摘要

在找尋石油的替代方案當中，氫能在二十一世紀將被視為相當重要的淨潔能源之一，不僅在交通運輸方面，電力供應也都將佔有重要的地位。本論文主要是研究一個有自產氫能力的加氫站系統，並探討其從生產到儲存最後並進行填充的相關現象與研究。利用美國Argonne國家實驗室所發展出的能源系統模擬軟體-GCtool與Matlab/Simulink軟體相互搭配使用，來模擬加氫站的運轉情形，並建構自己的模組；並同時探討國外加氫站實際運轉狀況。由於整個加氫站系統過於龐大且複雜，因此吾人選擇加氫站的產氫部分作為本文實際與模擬的驗證比較。產氫實驗分別利用碳板、鋼板和不鏽鋼鍍鎳板三種材質做為電極，結果顯示在常溫常壓下，電解質(NaOH)濃度為20wt%，電流密度為101.35 mA/cm²，產氫率分別為227.5、232.5和227.5 mL/min；並且將其放大估算成為商業級的產氫規格，且模擬從產氫系統產生每小時15立方米的氫氣產量，進入自製的加氫站模組中模擬發現。假設在350 atm的補給燃料條件下，整個壓縮儲存模組到充氫儲存模組當中，系統將會消耗2.71 KW的能量和移除(散失)0.48 KW的熱量；若在700 atm的補給燃料條件下，整個系統將會消耗3.32 KW的能量和移除(散失)1.82 KW的熱量。

關鍵詞：電解水、加氫站、GCtool模擬、Matlab/Simulink模擬

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