# 高熱傳導石墨膜應用於質子交換膜燃料電池之熱管理研究


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**摘 要**

質子交換膜燃料電池的熱管理包括排出電池內部廢熱，避免 電池內部呈現熱點而損壞整體燃料電池，保證電池穩定恆溫地運 行與提高燃料利用率。而質子交換膜燃料電池組的能量轉換效率 在40~60%，因此在運作時，有60~40%的廢熱必須排出，以維 持工作溫度恆定。而要製作出高效能燃料電池組，組裝與水熱管 理的問題相較於單電池起來便更形複雜與重要。 在燃料電池組熱管理的設計上，目前多以水冷或氣冷循環方 式和液體蒸發冷卻來達到散熱目的，但其亦造成冷卻流道的製作 成本、氣密問題與電池體積較大的負擔。本研究的新想法為以「高 熱傳導石墨膜」材料，應用其高熱傳導率的特性，結合在金屬流 道板面上來移除內部廢熱，此應用提供燃料電池熱管理機制另一 種選擇。 本研究探討生成水和溫度分佈之關係，主要是因為若陰極過 多的生成水會造成水氾濫(Flooding)現象，堵塞氣體的傳輸通 道，大幅地降低質傳的極限，造成燃料電池性能下降，若溫度過 高則造成質子交換膜乾涸現象。溫度探討部分以熱電偶在預設點 做接觸式量測，再配合透明流道觀測生成水分佈，結果顯示，若 加入此膜，可有效達到熱移除目的，且總體效能較佳，因此本研 究先以單電池為出發點，研究以高熱傳導石墨膜為散熱設計之燃 料電池熱管理，以提供後續燃料電池組熱管理設計之最佳化。



關鍵詞 : 質子交換膜燃料電池，熱管理，高熱傳導石墨膜。


**目錄**



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