質子交換膜燃料電池質傳及電流傳導問題之研究

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摘 要

本文利用數值計算方法探討質子交換膜燃料電池氣體擴散層 的質傳阻抗與歐姆電阻，以及流道板的歐姆電阻，並對氣體擴散 層與流道板之間的接觸電阻進行實驗量測。藉以瞭解氣體擴散層 與流道板厚度、氣體擴散層孔隙率、氣體擴散層與流道接觸面積、 以及流道板與氣體擴散層的接觸壓力等各參數對質傳以及電流傳 導效果的影響。 研究結果顯示：質傳效果隨著接觸面積的增加而增加，卻也 因為氣體擴散層厚度的增加而減少。當氣體擴散層與流道接觸面 積越大時，氣體擴散層厚度對質傳效果的影響將減到最低。氣體 擴散層的歐姆電阻遠小於質子交換膜；若以一般導電性良好的金 屬或石墨製備的流道板，其歐姆電阻亦小於質子交換膜。氣體擴 散層與流道板之間的接觸電阻隨著接觸壓力的減少而變大，接觸 壓力在10Bar 以內時，接觸電阻在質子交換膜內部電阻即佔有不 可忽略的重要性。

關鍵詞 : 質子交換膜、燃料電池、質傳、歐姆電阻、接觸電阻

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