氮化鈦作為高導電度耐蝕性載體應用於直接甲醇燃料電池之研究

執行單位	國立中興大學 化學工程學系(所)	計畫主持人	蔡毓楨

- 本研究目的在於開發新型高導電度耐腐蝕非碳載體，可克服過去使用碳材作為觸媒載體會發生的腐蝕現象，且使用時效性得以延長，以達到直接甲醇燃料電池得以長時間運作目的，提高商業價值，並期待能加以應用。

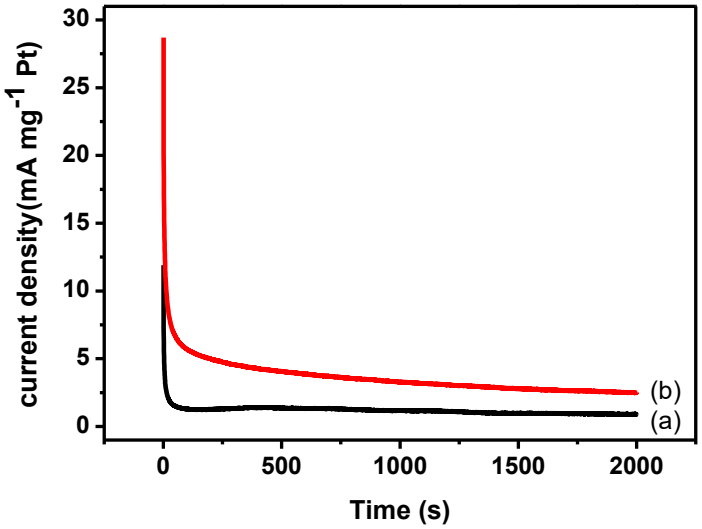

圖1. (a) Vulcan XC-72-Pt/GCE 和 (b) Pt/TiN 在2 M 的甲醇和1 M 的硫酸混合溶液中，施予電壓-0.2 V 之計時安培法比較。

- 直接甲醇燃料電池是解決現今能源問題的方法之一，但是應用上存在著甲醇在陽極氧化的電壓過高的問題。本研究計畫的目的是希望能以導電氮化鈦薄膜製作新穎高導電度耐蝕性非碳載體應用於直接甲醇燃料電池，將此導電薄膜沉積於基材上作為直接甲醇燃料電池陽極電極，並沉積鉑觸媒探討此陽極觸媒材料對甲醇氧化的活性。由於氮化鈦具有可媲美金屬材質的低電阻率、相當良好的化學穩定性以及高導熱率，其硬度高、抗腐蝕性佳，有別於目前以碳材作為載體製備直接甲醇燃料電池，氮化鈦於電化學反應中不會產生碳材載體腐蝕造成觸媒流失，能延長電極使用之時效，以增加甲醇燃料電池的效能和使用壽命，並減低觸媒材料的成本，提升甲醇燃料電池的市場競爭力。

Application of Titanium Nitride as High-conductivity Corrosion Resistant Carrier for Direct Methanol Fuel Cell Research

Execution Unit	National Chung Hsing University Department of Chemical Engineering
Project Director	Yu-Chen Tsai

- The purpose of this study is to develop a new type of highly conductive corrosion-resistant non-carbon carrier, and the use of timeliness to be extended in order to achieve long-term operation of direct methanol fuel cells to improve business value, and look forward to be applied.

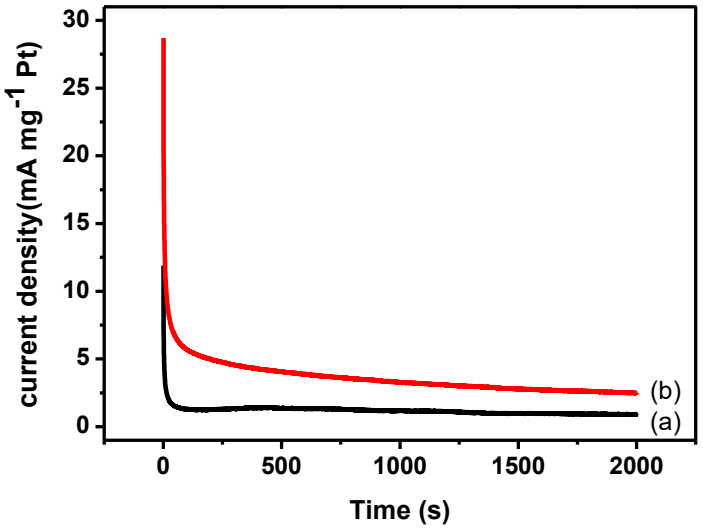

Fig 1. Chronoamperograms of (a) Vulcan XC-72-Pt/GCE and (b) Pt/TiN in 1 M H_2SO_4 present 2 M methanol at -0.2 V.

- Direct methanol fuel cells (DMFCs) are considered as one of the most promising choices to solve the energy problems in the future. DMFCs have numerous failure mechanisms, including the corrosion of the carbon support, the sintering and decomposition of catalystparticles. The corrosion of carbon support is referred to the oxidation of carbon, which is often observed in an electrochemical system that will lead to loss of catalysts accompanied with the carbon support. Titanium nitride(TiN) has high mechanical hardness, high melting point and has high electrical conductivity. Its resistance to corrosion and high conductivity make it an excellent candidate for the synthesis of highly durable electrocatalysts and electrocatalyst support.