ΙΤΕ/ΙΕΧΜΗ

ΣΕΜΙΝΑΡΙΟ Μ.Υ.

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ΟΜΙΛΗΤΗΣ: κα Αλίν Ορφανίδη

Υπεύθυνος Διατριβής: Dr. Στέλιος Νεοφυτίδης

ΘΕΜΑ: **Μελέτη ηλεκτροκαταλυτών Pt υποστηριγμένων σε τροποποιημένους νανοσωλήνες άνθρακα σε κελία καυσίμου υψηλής θερμοκρασίας τύπου PEM.**

Electrocatalytic Investigation of Pt supported on functionalized MWCNT catalyst in HTPEM fuel cells.

ΤΟΠΟΣ: Αίθουσα Σεμιναρίων ΙΤΕ/ΙΕΧΜΗ

ΗΜΕΡΟΜΗΝΙΑ: **Τετάρτη, 2 Μαΐου 2012**

ΩΡΑ: **12:00**

ΠΕΡΙΛΗΨΗ:

A new approach towards the development of electrocatalytic layers for use in high temperature polymer electrolyte membrane fuel cells (PEMFCs) is reported. This work is devoted to the development of an optimized electrocatalytic layer for the aforementioned system. In general, the catalytic layer used so far consisted of the catalyst Pt/C and the binder (polymer same as the electrolyte). In addition, the electrode is imbibed with phosphoric acid so that an improved ionic pathway is developed between the electrode and the membrane.

The present work studies the development of new Pt/CNTs based electrocatalysts for application in high temperature PEMFCs. The aim is not only the development of a more corrosion resistant catalyst with fine Pt dispersion. Modified carbon nanotubes (CNTs) were used as the support. MWNTs were selected due to their unique properties regarding electronic conductivity, specific surface area and their high corrosion resistance as compare to carbon blacks.

Toward the development of an optimized electrocatalytic system, there are two important considerations; the deposition of fine Pt particles on the carbon support and the construction of the electrocatalytic layer so that they can thoroughly participate in the electrochemical interface, thus being electrocatalytically active. This can be accomplished by the uniform distribution of polar moieties throughout the catalytic layer. Polar groups are expected to interact with phosphoric acid originating either by doping the electrode or from the electrolyte. In this way they will bind the acid molecules

Οδός Σταδίου, Ρίο, Τ.Θ. 1414, 265 04 Πάτρα
Τηλ.: 2610 965 300 & 3, Fax: 2610 990 987
www.iceht.forth.gr

creating proton conductive pathways throughout the catalytic layer resulting in the increase of the three phase boundary and ultimately the catalyst utilization. For this purpose the surface of the multi-wall carbon nanotubes were functionalized with pyridine and hydroxyl-pyridine groups. Thus, the acid–base interaction of the H3PO4 with the basic pyridine moieties is expected to secure the uniform distribution of the acid throughout the catalytic layer so that a 3D proton ionic link will provide an active electrochemical interface with all deposited Pt particles, as shown in figure 1.1 .

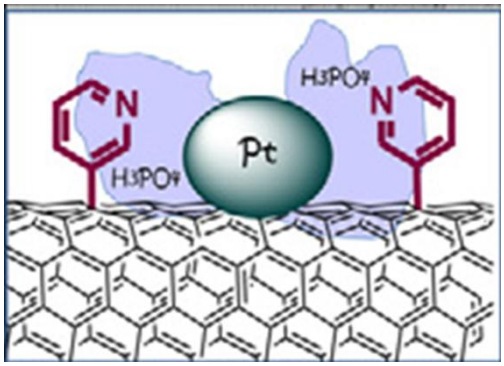

Figure 1.1 .Schematic model of the Pt/pyridine modified MWNT

The ex-situ characterization of the newly synthesized catalysts in combination with electrochemical characterization techniques, showed very promising results for applications in high temperature PEMFCs.