LOW TEMPERATURE FUEL CELLS H_2-O_2

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ABSTRACT

Fuel cells are inherently very efficient and clean, and they offer the best alternative to conventional power generation technologies. Several kinds of fuel cells exist, but actually the most important are the PEMFC. For fuel cells to be competitive issues such as cost, size and functionality need to be addressed. The aim of this work was to investigation of new type of catalyst in fuel cells technology.

1. INTRODUCTION

The electrodes are usually made of porous mixture of carbon supported platinum and ionomer. In other to catalyze reactions, catalyst particles must have contact to both protonic and electronic conductors. Furthermore, there must be passage for reactants to reach catalyst sites and for reaction product to exit. The contacting point of the reactants, catalyst, and electrolyte is conventionally reoffered to the tree-phase interface. In other to achieve acceptable reaction rates. The effective area of active catalyst sites must be several times higher than the geometrical area of the electrode. Therefore, the electrodes are made porous to form a tree-dimensional net-work, in which the tree-phase interfaces are located. [1,3]

The polymeric ion exchange membranes as electrolytes have been intensively studied in our laboratory as perspective materials for the electrochemical power sources. The polymer membrane fuel cells are considered to be highly prospective. They are based of strongly acidic ion exchangers such as NAFION® both as the membrane itself and as the ionic ally conductive binder of the electrocatalysts. However, the only electrocatalysts based on platinum are usable in connection with them and the use of anionic conductors might be interesting.

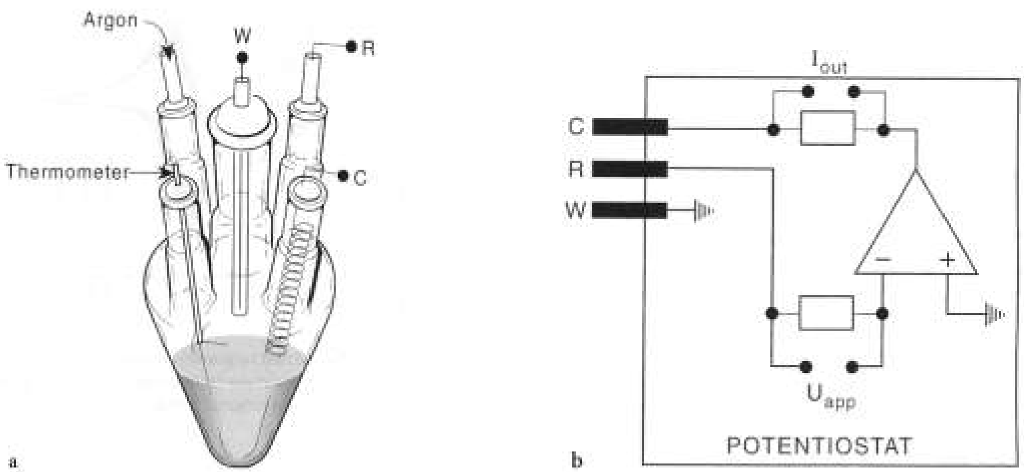
Powder materials are widely used in electrochemistry, thanks to their interesting properties, e.g. large specific area for a given mass of material. The characterization of their electrochemical activity is usually attempted using the graphite powder electrode (also known as composite electrode). However, such a technique suffer several drawbacks among which: the non-negligible amount (a few milligrams) of material used, the masking effect of the graphite powder which is electroactive in potential range of interest and the omic and capacitive effects originating both from the large thickness (several 10μm) of such electrodes and from the mandatory use of polymeric binder. [1]

In PEMFC electrodes, Pt/C is used as composite active layers, which incorporate a proton conducting polymer and possibly a hydrophobic binder, such as PTFE beads.

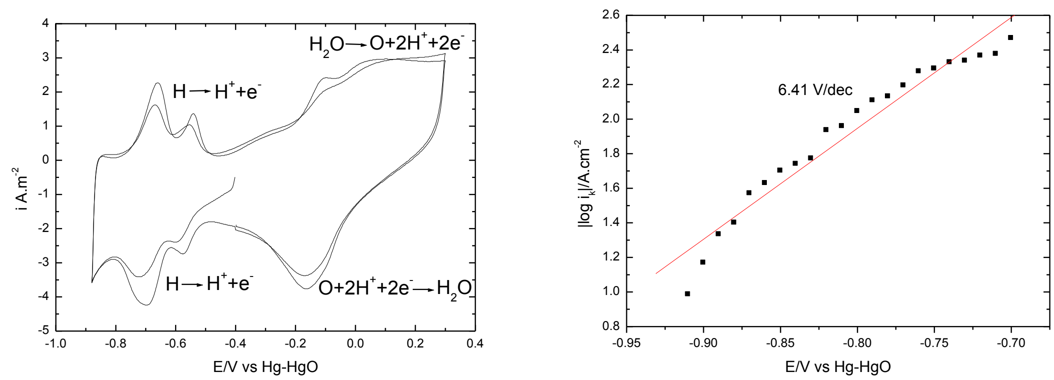
2. EXPERIMENTAL

The rotating disk electrode RDE experiments were carried out on active layers elaborated from Pt/C. The active layer precursor consisted of a suspension blend from 20mg Pt/C, solution in alcohol and distillate water. After homogenization in an ultrasonic bath, 4µl aliquot of this suspension was deposited on a glassy carbon electrode previously polished β-alumina. The electrochemical three-electrode cell set-up was connected to a numerical potentiostat (AUTOLAB, Ecochemie), the reference being an Hg-HgO electrode (Hg-HgO, 0,1V vs. NHE), the counter being Pt electrode; all the electrode potentials are however referred to the normal hydrogen electrode potential. [2] All experiments were carried out in 1M KOH solution at room temperature (293±K).

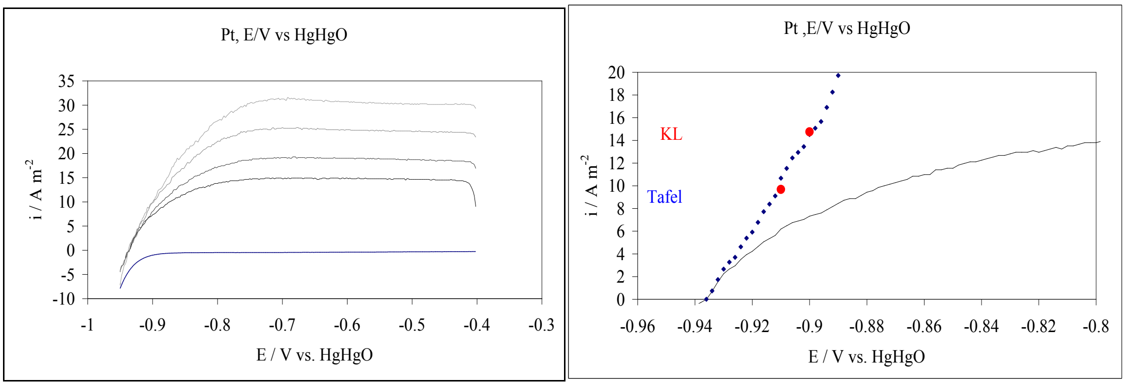
3. RESULTS AND DISCUSSION



Obrázek 1: a- experimental cell, b-set-up of measure system.



Obrázek 2: CV Pt/C , Argon. Tafel slop analyses .



Obrázek 3: Hydrodynamic system. K-L model.

Mathematic model: Koutecky-Levitch

$$\frac{1}{I} = \frac{1}{1.554 n.F.A.D^{2/3} \nu^{1/6}.w^{1/2} c_{\infty}} + \frac{1}{n.F.A.k'_{ME}.c_{\infty}} = i.\alpha \;/\Omega \qquad (1)$$

4. CONCLUSION

The electrochemical properties of active layers elaborated from carbon supported platinum have been determined from cyclic voltammetry using the glassy carbon RDE. This method C-V with using K-L math model is a promising method to characterize fuel cells electrocatalyst, both in the term of specific area but also in term of kinetic parameters determinations. The characterization of PEMFC anode active materials did demonstrate reproducible experimental data.[1]

5. ACKNOWLEDGEMENTS

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6. REFERENCES

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