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# Characterization and study of the electrolyte's solid base of Alkaline Membrane Fuel Cell (AFMC) with C/Pt electrode

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**Abstract** – Alkaline fuel cells are an attractive alternative to produce energy with high efficiency that still presents some challenges to be overcome as the functional difficulties caused by his liquid electrolyte. In this work the liquid electrolyte (KOH) was supported in a cellulose membrane that eased the fuel cell's operation. Two membranes with different thickness were studied and the influences of characteristics on the performance of the AMFC were evaluated by polarization curves. The morphology characterization was determinate by scanning electron microscopy (SEM) and also measurements of porosity and permeability were performed. The AMFC advanced major power with of the bigger thickness membrane.

Fuel cells are a device that produces energy from the chemical energy between hydrogen and oygen, generating as residues water and heat, which can be used to cogenerate more energy. Alkaline fuel cells presents high efficiency but this liquid electrolyte, composed by an alkaline solution of KOH, causes many functional difficulties. Alkaline Membrane Fuel Cell (AMFC) has as a differential a solid electrolyte with the alkaline solution supported in a cellulose membrane.

In this work two different membranes were studied. They were used in laboratory tests in AMFC prototype. The testes consist in support the alkaline solution (KOH 6M) in the electrolyte's base and then measure directly current and voltage produced by the single AMFC's assembled in the laboratory. In order to produce the cell polarization curve, the adjustable load resistance was reduced from open circuit to short circuit. The electrodes used were LT-250-EW, from BASF, with the load of 5g/m$^2$ of 30% Pt supported in Vulcan XC-72.

The morphology characterization was determinate by scanning electron microscopy (SEM) for both bases. Figure 1 shows two views of base number 1: superficial and transverse. The same is done in Figure 2 for the base number 2. It can be affirmed that both have cellulose fibers enlaced in an unordered way forming a porous material. Comparing both figures can be concluded that base number 1 has a minor thickness (0,2 mm) than base number 2 (0,8 mm).

Porosity of both bases was near: number 1 had a porosity of 80% and number 2, 71%.

The power produced by single AMFC on tests performed were higher in the one with base number 2 (0,6W) than in the one with base number 1(0,5 W), showing that the bigger thickness brings a gain in volume of solution absorbed and this compensates the higher voltage loss that could be caused by a higher membrane thickness.

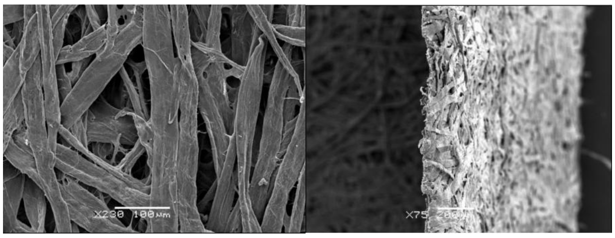

**Figure 1:** SEM of base number 1. Superficial and transversal views.

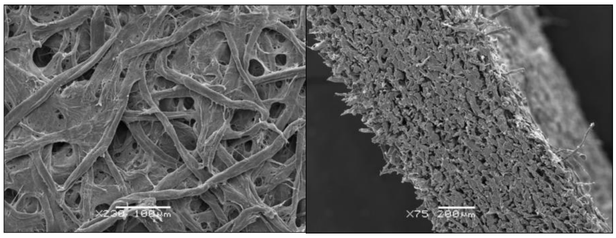

**Figure 2:** SEM of base number 2. Superficial and transversal views.

## References

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