

## Role of Biofilms in the performances of a fungal microbial fuel cell

Maxime PONTIE,<sup>a</sup>, Mehri SHABANI,<sup>a</sup>, Maxime VALAY,<sup>b</sup>, Christophe INNOCENT,<sup>c</sup>  
and Andriy YAROSCHUCK<sup>d</sup>

<sup>a</sup> Angers University, Faculty of Sciences, 2 Bd. Lavoisier, 49045 Angers cedex 01, France

<sup>b</sup> Origalys ElectroChem SAS, 62A, Avenue de l'Europe, 69140 Rilleux-la-Pape, France

<sup>c</sup> IEM, UMR CNRS 5635, 300 Avenue du Prof. Emile Jeanbrau, 34090 Montpellier, France

<sup>d</sup> Universitat Politècnica de Catalunya, Department of Chemical Engineering, Barcelona

Presenting author: [maxime.pontie@univ-angers.fr](mailto:maxime.pontie@univ-angers.fr)

Our research aimed to explore the biodegradation of organic micropollutants (i.e. diclofenac, acetaminophen) in a dual-chamber fungal microbial fuel cell (FMFC) recently developed (1). The microorganisms are of great advantage as they can be regenerated resulting in lower cost comparing to chemical ones. Also, no harmful by-products or wastes has been produced during the degradation process which makes MFCs an environmentally friendly way to generate energy. On one hand, biofilms deposited on electrodes (i.e. carbon felt) is very usable to oxidize micropollutants and generate  $H^+$  and  $e^-$  to reduce  $O_2$  in the cathodic compartment. On the other hand the cationic exchange membrane (CEM) will be covered by a biofilm, as illustrated by Fig.1 (a). It could cause the blockage in  $H^+$  migration mass transfer (see (2)).

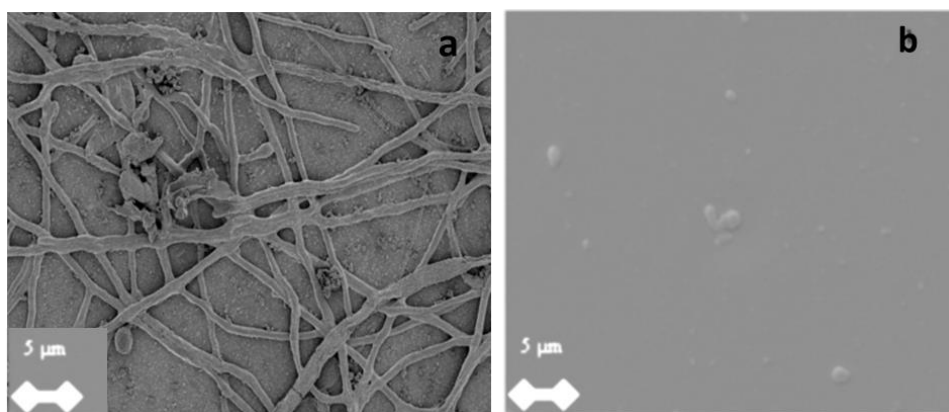


Fig.1 : 2D scanning electronic microscopy (SEM) images of Nafion 117 membrane used in a fungal microbial fuel cell : a- old membrane used in FMFC (10 days); b- pristine membrane

Furthermore, and unfortunately, SEM observations are a destructive tool for membrane. Further work in a near future will focus on the development of experimental and theoretical approaches using electrochemical impedance spectroscopy (EIS) *as in situ tool* for the detection of biofilm growth on CEM, in particular, for understanding its detrimental impact on limiting current density (3).

### References

- (1) Shabani, M.; Pontié M. *et al. J. Applied Electrochemistry*, **2021**, 51, 581 + ref. therein
- (2) Flimban, S.G.A. *et al. Int. J. of Hydrogen Energy*, **2020**, 45, 13643.
- (3) Zhen, H., Mansfeld, F. *Energy and Environ. Sci.* **2009**, 2, 215.