Biological and chemical applications of electropolymerized materials made from a mushroom polyphenol

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The electrodeposition of films from polyphenol containing solutions allows to produce functional and homogenous coatings on conductive materials from natural molecules known to display a broad range of biological properties [1,2]. In a previous PhD work performed at the INSERM 1121 Unit in Strasbourg, it has been shown that thick (up to 400 nm) and highly swollen films can be deposited on carbon and gold working electrodes from aqueous solutions of 1,8-dihydroxynaphtalene (1,8-DHN), a natural polyphenol from mushrooms. Those films display antioxidant activities and are antibacterial against several strains of *Pseudomonas Aeroginuosa* and can be transfered on polydimethylsiloxane sheets (Figure 1).

It is the aim of the proposed PhD work to enlarge the applications of the 1,8-DHN based films and to investigate their structure. In particular their biocompatibility, the possibility to use them as biosensors and their electrical conductivity (without or with the incorporation of few layer graphene during the electrodeposition) will be investigated. Finally the electrocatalytic properties of the 1,8-DHN films incorporating metalic nanoparticles will also be studied.

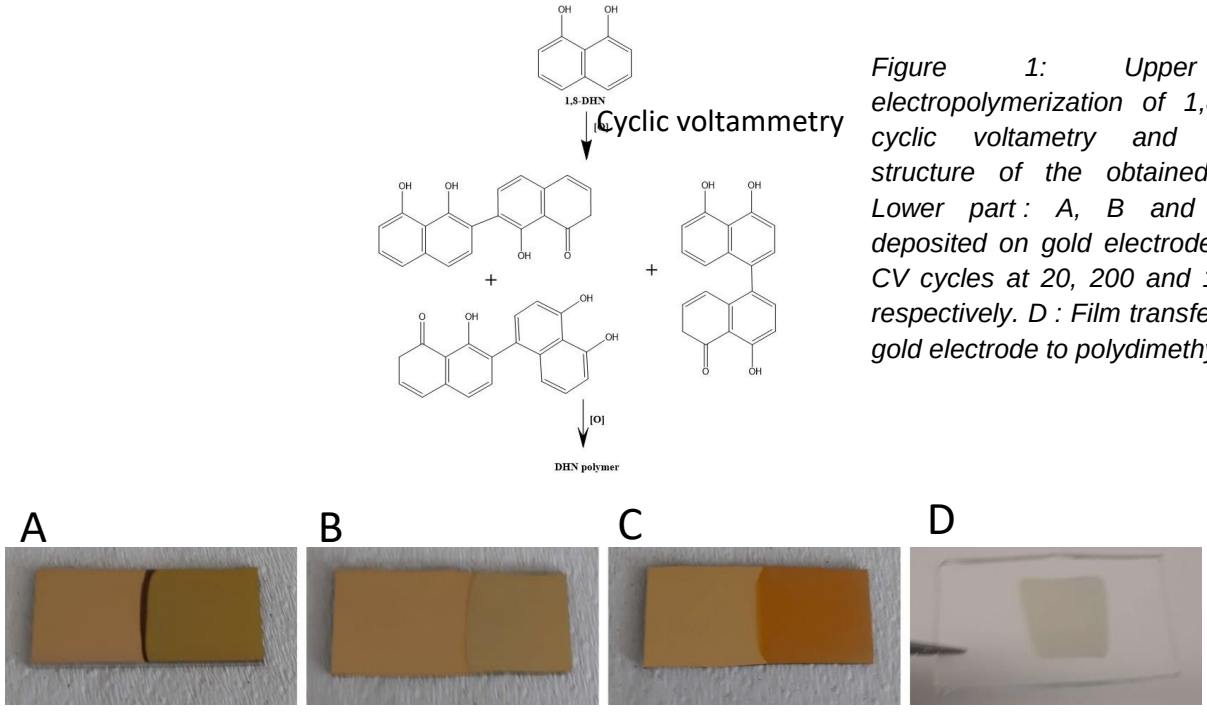

Figure 1: Upper part : electropolymerization of 1,8-DNN by cyclic voltametry and hypothetic structure of the obtained polymer. Lower part : A, B and C : films deposited on gold electrodes after 25 CV cycles at 20, 200 and 1000 mV/s respectively. D : Film transfered from a gold electrode to polydimethylsiloxane

[1] Ball, V. (2017) *Electrodeposition of pyrocatechol based films: influence of potential scan rate, pyrocatechol concentration and pH.* Colloids and Surfaces A: Physicochem. & Eng. Aspects. **518**, 109-115.

[2] Ortiz-Pena, N, Ihiawakrim, D.; Ball, V.; Stanescu, S.; Rastei, M.; Sanchez, C.; Portehault, D.; Ersen. (2020) *Correlative microscopy insight on electrodeposited ultrathin graphite oxide films.* J. Phys. Chem. Lett. **11**, 9117-9122.