Immobilized ferrocenium on conducting polymers as redox mediator in biosensors.

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Because of its electron-transferring abilities, ferrocene has found application as "redox mediator" in amperometric biosensors, especially in those based on conducting polymer matrixes. Ferrocene behaves as an electron shuttle and improves the electronic transfer between redox targets (i.e. active centres in enzymes) and the polymer matrix and/or the supporting electrode[1]. Biosensors based on conducting polymers have tried to incorporate this redox mediator either by physical entrapment [2]or by covalent binding to the polymeric structure [3]. The background of this study is to assess the suitability of the Fc^+ entrapped in sulphonated polyaniline (SPAN) films as a redox mediator for SPAN based biosensors, operative at physiological conditions.
SPAN-modified electrodes show an electrocatalytic behaviour towards Fc oxidation due to strong Fc^+ adsorption in the SPAN film. In situ-FTIR study provides spectroscopic evidences of this phenomenon. Sulfonate groups are proposed as adsorption sites for these positive charged species. Thus, SPAN-modified electrodes can be easily "doped" with a redox mediator by performing cyclic voltammetry in Fc^+ aqueous solutions. This could be the basis of a new pathway to obtain inexpensive second generation biosensors, operative at neutral pH. Therefore, preliminary test dealing with the determination of Cyt *c* using SPAN-Fc+ films were attempted. A remarkable increase in the oxidation of ferrocene was observed probably due to the oxidation of the redox prosthetic group of Cyt *c* by ferrocenium immobilized on the polymer, which increases the concentration of ferrocene in the film near the electrode.

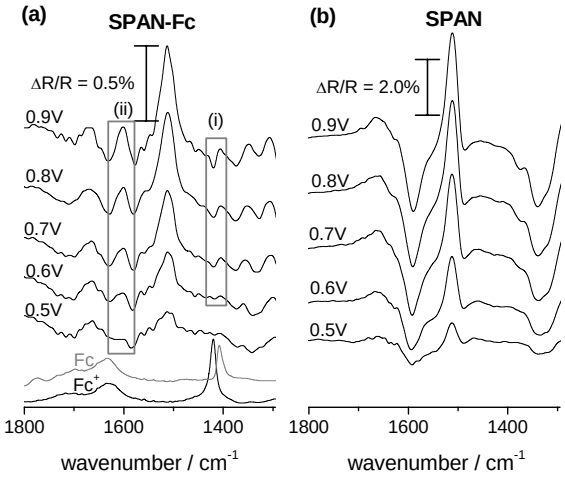

Figure 1 In situ-FTIR spectra in buffer solution at pH 7.3 of a) SPAN/Fc^+ and b) SPAN-modified Pt disc electrodes.

References:
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[2] Y. Kajiya, R. Tsuda, H. Yoneyama. J. Electroanal. Chem. 301 (1991) 155. *Conferment of cholesterol sensitivity on polypyrrole films by immobilization of cholesterol oxidase and ferrocenecarboxylate ions*
[3] A. Mulchandani, C.-L. Wang, H.H. Weetall. Anal. Chem., 67 (1995) 94.*Amperometric detection of peroxides with poly(anilinomethylferrocene)-modified enzyme electrodes*