CHARACTERIZATION OF MODIFIED SOLID ELECTRODES WITH ORGANIZED THIN FILMS OF A ZINC PHTHALOCYANINE

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Phthalocyanines (Pc) and metallo-phthalocyanines (MPc) have been used for many years as blue and green dyes, but recently they have also been investigated for their applications as catalyst and chemical sensors, and in electronic and photonic technologies [1]. These applications usually require a thin film deposited on a solid substrate. Several studies have investigated these systems, and some of them have studied the characteristics of organized Langmuir and Langmuir-Blodgett (LB) films. The redox behaviour of these compounds has been mainly studied in solution, but modified Pc and MPc solid electrodes have deserved much more attention in recent years. Solid electrodes can be modified by using several techniques, such as casting, adsorption or LB film formation, and different film characteristics should be expected from each technique, and consequently different electrochemical responses.

In particular, zinc phthalocyanines (ZnPc) have received less attention [2-4]. In this work the electrochemical response of modified carbon solid electrodes with ZnPc thin films will be reported and discussed in relation to the ZnPc deposition techniques. Topographic characterization was made using Atomic Force Microscopy. The voltammograms of these modified electrodes show differences in respect to those obtained from solutions in organic solvents, but still showing some oxidation (I_o) and reduction (I_r) peaks. Films obtained by immersion and LB techniques present more similar behaviour than those obtained by drop casting, and this behaviour can be correlated with the differences in structure shown by the films. For the LB films, an influence of the extraction pressure and of the number of layers has been observed. Drop casting films show a more pronounced response to the exposure to air oxygen, a fact that could be used for oxygen sensing applications. Figure 1a shows the voltammogram of the response of a LB film of a tetra-tert-butyl substituted ZnPc deposited on a glassy carbon electrode (GCE), and Figure 1b shows the corresponding AFM image.

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References

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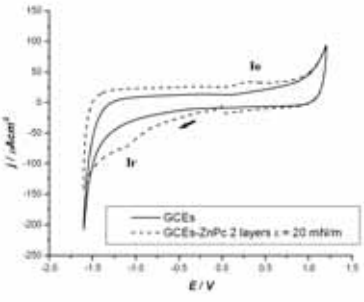
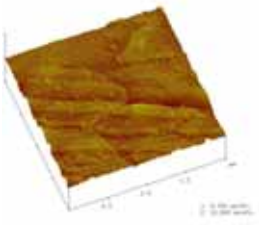


a)



b)

Figure 1. a) Voltammogram, and b) AFM image, of a ZnPc LB film at Π=20 mN/m.