Adsorption and Electrochemical Behaviour of Cyt-c on Transparent Mesoporous TiO_2 Films

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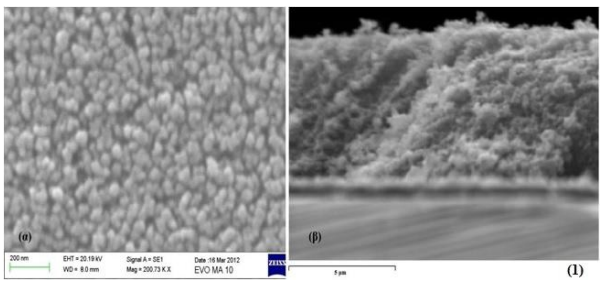
The immobilization of biomolecules upon electrodes and other surfaces is important not only for studying their function and structure but also for the development of bioanalytical devices such as biosensors. We investigate in this study the use of mesoporous optically transparent TiO_2 films as substrates for protein immobilization.

TiO_2 films with developed mesoporous architecture are among the best candidates as host matrices for the incorporation of various optoelectroactive guest molecules. The films have a high surface area, are optically transparent, exhibit good electrical conductivity (wide bandgap ～ 3.2 eV) and can be prepared by low cost screen printing technologies for the development of dye sensitized solar cells, electrochromic displays, electrodevices and colorimetric chemical sensors.

Therefore in this study, their ability to provide a novel and versatile immobilization surface for biomolecules and the development of an amperometric biosensor for H_2O_2 will be examined. The resulting TiO_2 films were structurally characterized by a variety of techniques such as SEM (see figure 1), TEM, XRD and BET analysis. In addition a thorough study of the binding of Cytochrome-c upon them [1] and the parameters that influence its adsorption are presented. [2] Finally, with the use of a 3-electrode electrochemical cell, electrochemical techniques such as cyclic voltammetry and spectroelectrochemistry (see figure 2) were used in order to investigate the electrochemical behavior of the immobilized biomolecules and their potential use for the development of an electrochemical biosensor for H_2O_2.



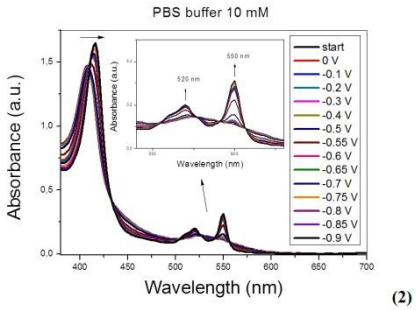


Figure 1: SEM images of TiO_2 thin film (top view and cross section).
Figure 2: Spectroelectrochemical study of Cyt-c/TiO_2 in PBS buffer 10 mM, pH 7.

References

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