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Supplementary Material

ENHANCED PHOTOCATALYTIC ACTIVITY OF TiO_2 FILMS BY MODIFICATION WITH POLYETHYLENE GLYCOL

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UV-VIS SPECTROSCOPY CHARACTERIZATION OF TIO_2 FILMS

The spectra for the films with 1, 3 and 5 layers prepared from the different sols are showed in the Figure 1S. It can be observed that as the number of layers increases the films become less transparent, due to a greater light interference caused by the thickness of the films,[1] which allows the less energetic radiations to be absorbed as well in the visible and low energy UV range. This causes the characteristic TiO_2 absorption peak (between 300 and 375 nm) to both increase its height and expand towards greater wavelenghts. This tendency is quite evident for the films obtained from the 12 g L^{-1} PEG 8000 modified sol, which generated very opaque films, even with one layer, as observed in the Figure 7b. In general, the PEG modified TiO_2 films (Figures 1Sbd) showed peaks in wave patterns in the range of 310 to 800 nm approximately.

The band-gap energies of the TiO_2 films were estimated from Figure 1S and are summarized in the Table 1S. The redshift of the absorption edge of the TiO_2 films produced by the increase in the number of dippings, involves a decrease of the bandgap energies (E_g) from 3.55 eV (1 layer) to 3.32 eV (5 layers) for the unmodified TiO_2 film and from 3.60 eV (1 layer) to 3.41 eV (5 layers) for the film obtained with the 24 g L^{-1} PEG 3350 modified sol (Table 1S).[2] However, due to the small shift observed in the band-gap energies, it can be assumed that the employ of PEG for obtain porous TiO_2 films, do not modify the TiO_2 electronic structure, or

Table 1S. Band-gap energies estimated for the formed TiO_2 films

TiO_2 Film	λ (nm)	E_g (eV)
Unmodified - 1 layer	350	3.55
Unmodified - 3 layers	370	3.36
Unmodified - 5 layers	375	3.32
Modified with 24 g L^{-1} PEG 3350 – 1 layer	345	3.60
Modified with 24 g L^{-1} PEG 3350 – 3 layers	352	3.53
Modified with 24 g L^{-1} PEG 3350 – 5 layers	365	3.41

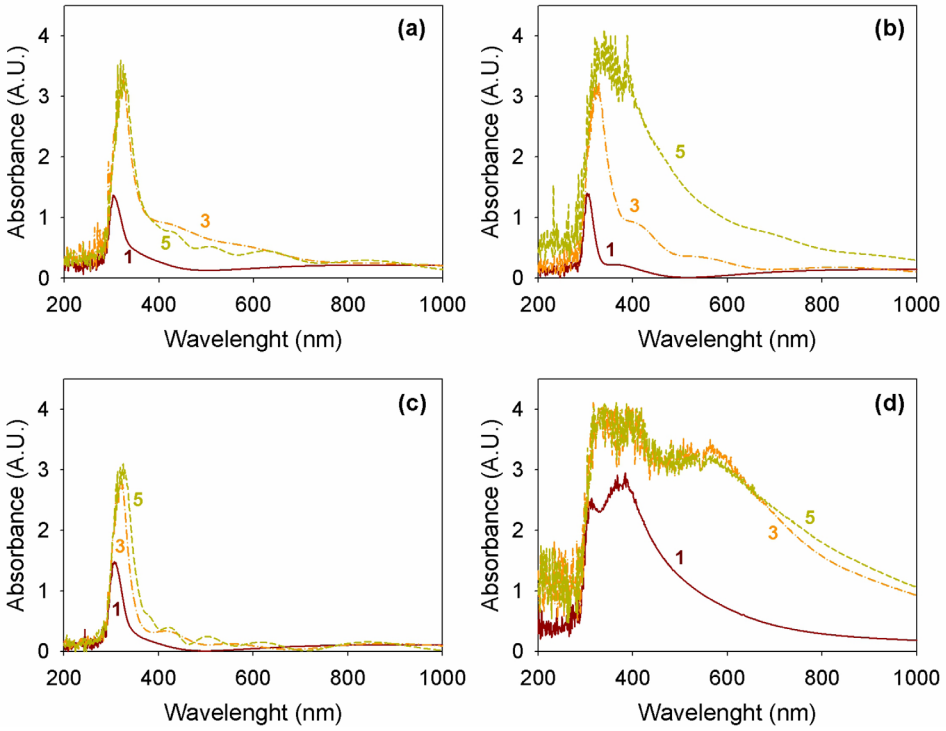

Figure 1S. *Effect of the number of layers (1, 3 and 5 layers) on the light absorption of the TiO_2 films : (a) No PEG, (b) 12 g L^{-1} PEG 3350, (c) 24 g L^{-1} PEG 3350, (d) 12 g L^{-1} PEG 8000*

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induce states inside the bandgap of the semiconductor. The bandgap energies for the remaining films (films prepared with sols modified with 24 g L^{-1} PEG 3350 and 12 g L^{-1} PEG 8000) were not calculated due to their opacity.

The increase of PEG concentration in the sol from 0 to 12 g L^{-1} also causes an increase in the absorbance of the TiO_2 films, due to the scattering of light by the pores generated by the organic compound (Figures 1Sa, b, d). However, a posterior increase of PEG concentration from 12 to 24 g L^{-1}, carries a decrease in the absorbance of the films, which is due to the increment of the diameter and of the interconnection of the pores (Figures 1Sa, c). This indicates that the differences in absorbance among the films are due to the differences in the size and interconnection of the pores and to the thickness of films.

REFERENCES

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