Hydrophilicity as a strategy to enhance the sensitization of nanostructured films by chemical bath deposition.

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The sensitization of titanium dioxide with organic dyes or narrow-band gap semiconductors has been explored extensively in photoelectrochemical cells [1-3]. Other applications regarding TiO_2 are based on the high versatility of its surface properties. Particularly, the hydrophilicity of TiO_2 under UV illumination, reported by Wang et.al. [4], have been used in many practical applications. In this work, we explore the hydrophilicity of TiO_2 as a tool to control the growth and properties of sensitizing films obtained by chemical bath deposition.

We report the structural, optical and electrical characterization of Bi_2S_3 films grown by chemical bath deposition onto hydrophobic/hydrophilic TiO_2 obtained by sol-gel techniques and UV-irradiation treatments. Important differences were found, which can be explained in terms of TiO_2 dissolution in alkaline media and surface coverage by Bi_2S_3. The last is strongly related to the hydrophilic character of the porous matrix at intermediate deposition kinetics, but becomes less relevant in photo accelerated chemical baths.

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