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THIN FUNCTIONAL FILMS OF TiO_2 NANOPARTICLES

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Most of the semiconductor thin layers practically employed as photoactive electrodes reveal very low extent of characteristic (periodic) structural features. They are composed of arrays of pores of various shapes, sizes and volumes, mixed crystallographic phases, etc. and phenomena associated with their functions take place on surfaces containing physical (e.g. pits, ridges) and chemical (e.g. polar sites) defects. However, it is possible to produce very uniform, organized structures finalized as thin layers and exhibiting unique properties and functions. Here we report on preparation of titanium (IV) oxide nanoparticulate thin films by a series of methods. Physical methods include Barrier-torch Discharge deposition, Magnetron Sputtering and the Modulated Hollow Cathode Plasma Jet Sputtering. As chemical method the sol-gel process carried out in the templating environment as dip-coating and piezo-jet printing was employed. The produced films differed in many structural characteristics and also in their photoelectrochemical behaviour, as the primary sought function. The produced layers were described by means of atomic force microscopy, scanning electron microscopy, X-ray diffraction, X-ray photoelectron spectroscopy, ultraviolet-visible spectroscopy, Raman spectroscopy, ellipsometry and profilometry. Then the films were used as electrodes in photoelectrochemical experiments.

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