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PHOTOACTIVITY OF VANADIUM OXIDE TiO_2 NANOTUBES

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The aim of this study was to investigate the influence of vanadium oxide photosensitive surface layer on the photoactivity of TiO_2 nanotubes. Nanotube arrays were synthesized by anodization of titanium foil at different voltages, and vanadium-oxide was deposited by wet chemical deposition. Deposition of the vanadium-oxide layer was confirmed by XPS analysis, which provided the chemical composition of the sample surface. Photovoltaic characteristics and photocatalytic performance for photodegradation of methyl orange dye of modified TiO_2 nanotubes were correlated with the nanotube morphology (and anodization voltage). Optimal anodization voltage was determined, in conjunction with the deposition of the surface vanadium oxide layer, in order to achieve maximum performance of the modified TiO_2 electrodes. This has been correlated with changes in the optical properties of the TiO_2 electrodes, the nanotube length and diameter, as they occur with the change in the anodization voltage, as well as the changes in the vanadium-oxide content in the samples, where the vanadium-oxide content was found to be determined by the nanotube morphology. The photovoltaic performance of the optimized modified TiO_2 electrode with the surface vanadium-oxide layer was found to be significantly better than both the performance of the corresponding TiO_2 electrode, and the performance of all the other TiO_2 electrodes included in the study.