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Fine structural disorders in nanostructured TiO2 films for photovoltaic applications.

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Abstract

Abstract: In the last years, interest on renewables energies has increased and solar energy is one of most promising alternatives to get clean and worldwide available energy. Photovoltaic devices have been designed and applied to convert photons coming from Sun into electrons. Dye-Sensitized Solar Cells (DSSCs) are a good example because of its low-cost fabrication and good performance reaching about 12% efficiency conversion. However, DSSCs presents several problems like poor stability. Several methods and novel materials have been studied to improve DSSCs' stability, for example, changing the dye molecules´ structure to improve dye-attachment to the TiO2 surface and substituting liquid solvents in the electrolyte solution for quasi-solid-state electrolytes. These improvements have been studied from photovoltaic and electrodynamical point of view and corelated with changes on the TiO2 surface in somehow, however, these studies have not proven yet if there are a relationship between the observed photovoltaic and electrodynamical behaviors and changes on the TiO2 lattice. As starting point, in this work, we studied the changes on TiO2 nanostructured films when they are compared with an ideal TiO2 structure, i.e., bulk sample. Our results indicates that a nanostructured sample results in a more stressed and disorder crystal network than the lattice from the bulk sample, these characteristics have been related with the increase of oxygen vacancies at the TiO2 surface, known as energy traps.

About

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