TiO_2@CNT hybrid nanostructures grown in porous alumina membranes and their use in photocatalytic water splitting

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Efficient capture of solar energy by semiconductors to produce hydrogen through the splitting of water molecules, is one of the most important challenges of energy sciences nowadays. Recently, it has been found that a successful way to improve the efficient of this process is by using doped semiconductor and nanostructures in order to enhance the absorption in the visible light spectrum and prevent the recombination of the electron-hole pair generated [1, 2].

In this contribution we present experimental aspects related to the fabrication of nanoporous alumina (AAO) supported onto a silicon substrate and how this membrane can be used as a template for the fabrication of hybrid nanostructures of Carbon Nanotubes (CNT) and TiO_2 (TiO_2@CNT). First, the CNTs were grown by acetylene decomposition in a Chemical Vapor Deposition system and using a silicon supported AAO membrane as template. Then, titanium tetraisopropoxide was decomposed in the CVD system in the presence of CNT/AAO/Si substrates in order to grow a thin TiO_2 layer inside the CNTs [3]. The obtained samples were characterized by using SEM, TEM, and Raman Spectroscopy. The photocatalitic performance of these arrays in the water splitting was evaluated by measurements of photocurrent.

Figure 1(a) and (b) shows SEM images of the surface of a (a) bare AAO, and (b) AAO membrane with TiO_2@CNT nanohybrid inside. Figure 1(c) is a TEM image of a TiO_2@CNT hybrid nanostructure.

Figure 2 shows photocurrent measurement, which is related to splitting of water by using these hybrid nanostructures.

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References

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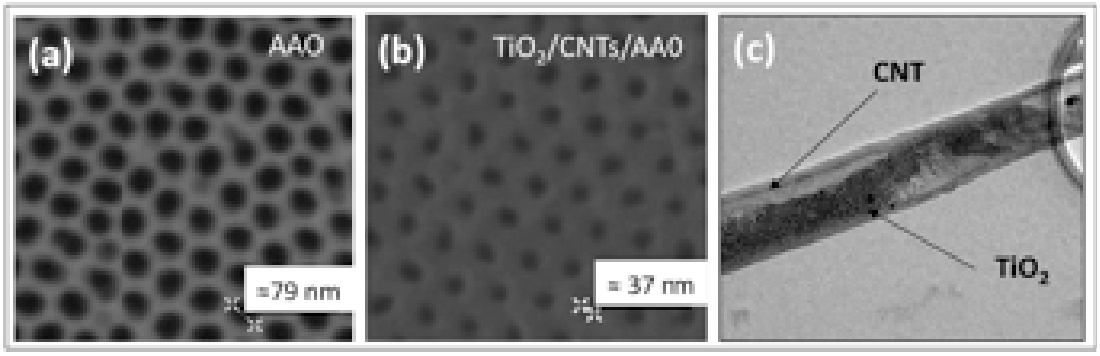

Figure 1. *(a) and (b) are SEM images of bare AAO and TiO_2@CNT nanohybrid inside of AAO respectively. (c) TEM image of a TiO_2@CNTs nanohybrid.*

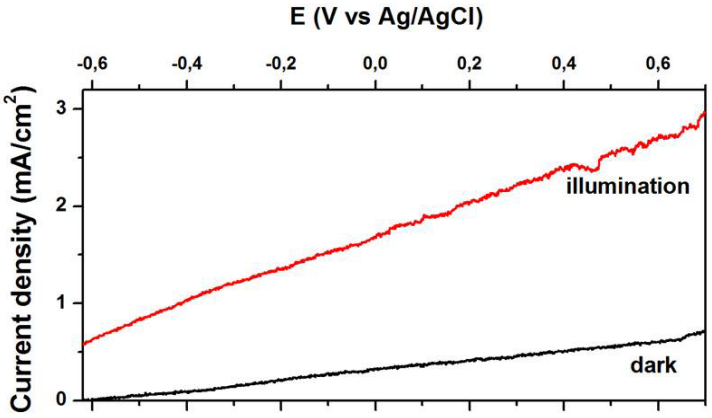

Figure 2. *Photocurrent measurement of a TiO_2@CNT hybrid nanostructures under dark and 150 W solar simulator illumination in a 0,1M KCl electrolyte.*