

THE INFLUENCE OF DIFFERENT CORROSION SOLUTIONS ON THE TiO₂ MORPHOLOGY OBTAINED BY THERMAL OXIDATION OF Ti FOILS

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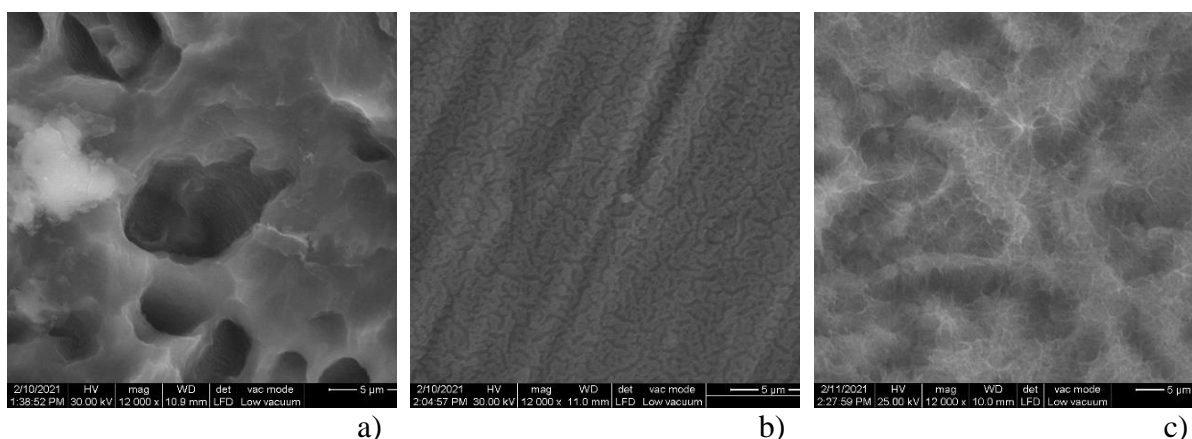
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Abstract

Titanium dioxide (TiO₂) is a well-known material having increased interest over the past decade in a wide range of application due to its advantageous features, such as long lifetime of excited electrons, excellent long-term chemical stability, non-toxicity, environmental safety, and relative low cost. Because of its large band gap (~3 eV) TiO₂ can absorb only in the UV region of the spectrum, this enabling it to be used in a wide range of applications like photocatalysis, UV and gas sensing and photovoltaic devices. The increasing of the surface/volume ratio of the nanostructures can also improve the targeted performance. The focus of this work is to show the influence of the chemical corrosion process, in acids and bases, on the surface morphology of the TiO₂ structure grown by the thermal oxidation of Ti foils. The synthesis of TiO₂ by corrosion growth and thermal oxidation is a low-cost process that can have a wide range of application. In this study, an aqueous mixture of HF was used as an acid corrosive solution, and as base solution NaOH aqueous mixture was used, both having the role of increasing the surface area of the titanium foils. After the chemical corrosion process, the titanium plate was washed with distilled water, then dried in vacuum condition. For the achievement of titanium oxide with high surface area structure, a thermal oxidation process has been applied in a controlled atmosphere consisting in a mixed gas flow of Ar and O₂, at a temperature of 500 °C for 4 hours. Moreover, by immersing titanium plates in an acidic solution followed by basic solution, and after a thermal oxidation process was applied, interconnected wires of TiO₂ layer was obtained. Scanning electron microscopy (SEM), X-ray diffraction (XRD), and UV-Vis spectroscopy were used to characterize the obtained TiO₂ nanostructure.



SEM images of the samples treated in (a) 0.05 M HF at a 48 h immersion time, (b) 5 M NaOH at a 48 h immersion time, and (c) 0.05 M HF at a 48 h immersion time + 5 M NaOH at a 48 h immersion time.

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