Characterization of the structure of TiO2 P25 modified by mechanosynthesis

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ABSTRACT

Structural changes in the modified P25 TiO_2 were studied from mechanosynthesis method at 650 rpm at different times in air. These materials were characterized by Raman, XRD and UV-VIS reflectance. X-rays show changes in the crystallinity of TiO_2 as new corresponding phases appear to deformation generated by the mechanical stress to which it is subjected, also, decreasing grain size generates a frequency-range which reflected in the widening of the diffraction peaks, this behavior is further confirmed in the results of Raman spectroscopy while the spectra of UVVis diffuse reflectance, shows that the milling time changes the electrical conductivity of the material, so that the mechanosynthesis applied on the TiO_2 can modify the properties of electrical conductivity of the material, also, it was determined that the electrical properties of the material are a function of particle size.

METHODS

Was synthesized through mechanical grinding P25 TiO2 600 RPM in air atmosphere and samples were obtained at time 0, 30, 90, 390 and 780 minutes to be characterized by difracció X-ray, Raman spectroscopy, UV spectroscopy of diffuse reflectance absorption spectroscopy and the catalytic photodegradation red litmus

RESULTS

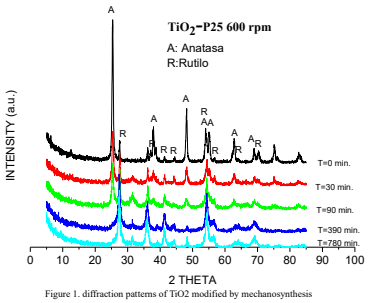

Figure 1. diffraction patterns of TiO2 modified by mechanosynthesis

In Figure 1 there is a decrease in the intensity of the characteristic peaks of the anatase phase [1] according to the treatment time while the rutile crystalline phase shows an increase.

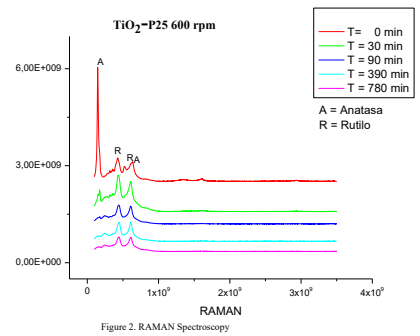

Figure 2. RAMAN Spectroscopy

Raman spectra are shown in Figures 2 corroborate the results of x-rays which clearly decreased anatase crystalline phase [2] and the rutile phase is observable is stable through the process mechanosynthesis

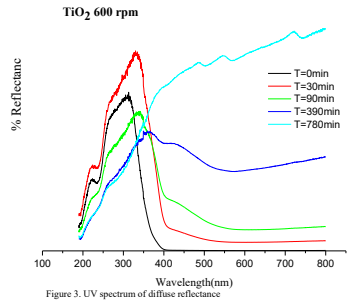

Figure 3. UV spectrum of diffuse reflectance

Reflectance spectra shows the presence of plasmon, generated by stoichiometric defects [3] in the rutile, which in turn generate a color change in the catalyst.

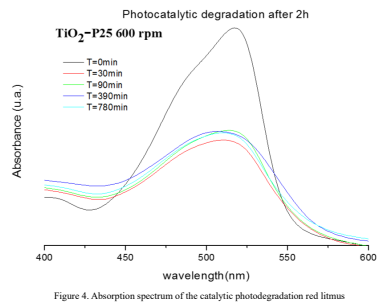

Figure 4. Absorption spectrum of the catalytic photodegradation red litmus

The decrease in particle size by mechanical grinding TiO_2 increases its catalytic activity with respect to the reference, noting that there is a maximum growth of activity with regard to the type of grinding.

CONCLUSION

The particle size and phase of p25 TiO_2 are crucial to the photo degradation catalytic due to the formation of non-stoichiometric sites in the structure allowing plasmon-photon interaction generating a greater number of electronic transitions in a greater range of UV-visible.

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