

# Titanium Dioxide Nanofibers photosensitized with Porphyrin for Efficient Degradation of textile dyes in Water

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## Abstract

One-dimensional Titania nanostructures, as nanofibers (TNF) have been intensely studied because of the promising application of these materials in the field of destruction of pollutants in water, due to their high specific surface area, ion- exchange ability, low density and better optical properties. The capability to utilize  $\text{TiO}_2$  nanomaterials for these purposes arises from the enhanced reactivity of nanoparticulate  $\text{TiO}_2$  compared to that of the bulk material. In the specific case of heterogeneous photocatalysis, the photocatalytic activity of  $\text{TiO}_2$  has been reported to depend on the size of the particles. In this study, pure titania nanofibers were synthesized using hydrothermal method.

The photocatalytic degradation of methyl orange was studied, in the presence of TNF photosensitized with 5-(2hydroxy-5-methoxyphenyl)10-15-20-triphenyl porphyrin as photocatalyst. Scanning electron microscopy (SEM), X-ray diffraction (XRD), fourier transform infrared (FTIR), UV-vis diffuse reflectance spectroscopy (UV-vis DRS) and nitrogen adsorption techniques have been used to investigate the structure, morphology, crystalline structure and optical properties of TNF synthesized. The photochemical characterization was followed by production of singlet oxygen  $^1\text{O}_2$  species and reactive oxygen free radicals such as  $\cdot\text{O}_2$  and  $[\cdot\text{OH}]$ . The photocatalytic performance is evaluated by the photocatalytic degradation rates of methyl orange in aqueous solution under UV-Vis light irradiation, and is possible to observe a complete degradation of methyl orange after 480 min of irradiation. The higher activity observed for the TNF photosensitized with porphyrin indicates improvement of the electron transfer between the sensitizer and the TNF in contrast to the TNF without modified. The studies show that TNF might be potential photocatalysts for the removal of dyes from wastewater.

## References

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## Figures

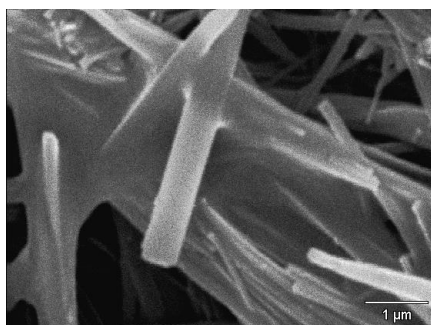


Figure 1. SEM image  $\text{TiO}_2$  Nanofibers

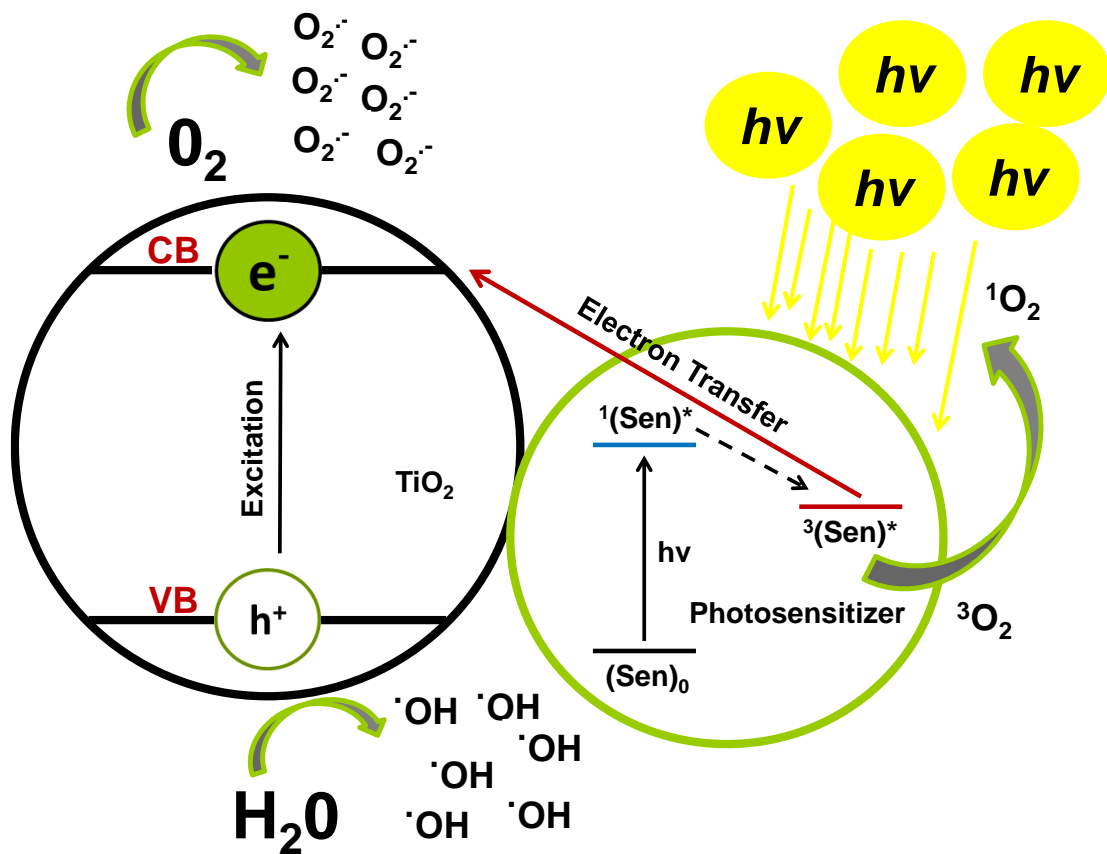


Figure 2. Schematic diagram of photocatalytic mechanism