



ABSTRACTS: VOLUME 5, SPECIAL ISSUE

ABSTRACT

Urea Modified TiO₂ Nanoparticles Prepared by Sol-Gel Method to enhance the Photocatalytic

Bilal Abu Alomareen, Amal Alkahloot.

Department of Physics, Faculty of Science, Al-Azhar University, Gaza, Palestine.

Background: Photocatalytic process is performed when the material absorbs energy from the sun, for example, or from an ultraviolet light source that is at least equal to the energy gap. Electrons move from the valence band to the conduction band, so we have an electron in the conduction band and a positive hole in the valence band. The positive hole is a strong oxidizer that can oxidize particles.

In this work the TiO₂ nanoparticles will be prepared with different concentration of urea in order to get modified TiO₂. We will also study the effect of urea modified TiO₂ on the photocatalytic process.

Objectives: To improve photocatalytic efficacy in TiO₂, and use it in water filtration applications.

Methods: Titanium tetraisopropoxide ($[\text{Ti}(\text{OCH}(\text{CH}_3)_2)_4]$) will be diluted with ethyl alcohol (EtOH) to avoid strong hydrolysis reactions. Then distilled hydrochloric acid (HCl) as catalyst dissolved in the remaining EtOH will be added dropwise to the EtOH and titanium tetraisopropoxide solution under continuous stirring at room temperature for thirty minutes.

Results: the UV–Vis absorption spectra of MO (M) on pure and urea modified TiO₂ catalyst under sunlight irradiation. In comparison with UV–Vis characteristic absorption peak of the initial methyl orange solution, the apparent decrease of absorption intensity indicated the photocatalytic capability of the catalyst to degrade methyl orange. Photodegradation of the MO aqueous solutions on the pure TiO₂ and the urea modified TiO₂ nanoparticles under sunlight irradiations were



studied in the experiments. Fig. 2 shows degradation variations of the MO solutions at 465 nm with irradiation time in sunlight. The photodegradation on the powders were increased with increasing irradiation time. The rate of photodegradation on the urea(5 and 7) modified TiO₂ nanoparticles was obviously larger than on the pure TiO₂. After 10h of sunlight irradiation, the degradation of MO is up to~ 95% and the absorption peak is totally removed. The high activity of urea modified TiO₂ catalysts under sunlight irradiation is due to the presence of nitrogen species.

Conclusion: Pure TiO₂ and urea doped TiO₂ (urea as nitrogen source) nanoparticles were prepared by the sol–gel method, and its photocatalytic performance was tested by Methyl orange (MO) degradation under sunlight irradiation. Doping of urea shifted the band-gap absorption edge to visible light region and reduced recombination of photogenerated electron-hole pairs. Hence, the as-synthesized urea doped TiO₂ nanoparticles show better photodegradation rate of reactive MO as compared to that of pure TiO₂ under sunlight irradiation.

Keywords: Photocatalytic, TiO₂, urea, UV-Vis.