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SYNTHESIS AND CHARACTERIZATIONS TITANIUM DIOXIDE NANOCOMPOSITE BY LASER ABLATION FOR ANTIMICROBIAL APPLICATIONS

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Bachelor Degree	*University of Basra*	*1997*	*General biology*
Master of Science	*Thi –Qar University*	*2013*	*Immunology*
Doctor of Philosophy	*UPSI University*	*-*	*Biotechnology*

Project / Emphasis: The effect of nanoparticles and abate in Aedes aegypti's to evaluate the antioxidant, oxidative stress markers and its fecundity.

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RESEARCH HIGHLIGHTS

Background*:* a composite nanoparticles containing Titanium Dioxide are synthesized by pulsed laser ablation. oxide nanoparticles NPs have wide ranges of physical, chemical and biological properties. The main advantages In the present work, studying the characterization of colloid TiO_2 NPs were synthesis by PLAL and investigated the antibacterial activity of colloidal TiO_2NPs compared to the antibacterial activity of synthesized composite nanoparticles was tested against four different pathogen bacteria two-gram negative *(Escherichia coli* (E. *coli*), *Klebsiella pneumoniae* (*K. pneumoniae*)), institute of bioscience UPM university kindly supplied these bacteria. The bacterial suspension was made and adjusted by comparison against 0.5 Mc-Farland turbidity typical (5x 107cell ml-1) tubes. It was further diluted to obtain a final of 5 x 106cell ml-1. All bacteria strains were culture in agar media. The media was inoculated by the 0.2 ml/5ml with either the bacteria strains, then added 0.5 ml of TiO_2 nanoparticles at concentration200, 400,600 ml-1. The samples were incubated at 37 °C. The bacterial growth was measured by optical density that absorbs strongly at 532 nm wavelength. Conclusion that is the mean values of inhibition were calculated from triple evaluation in each assessment.

Keywords: AntiBactrai, Nanoparticles, Titanium Dioxide.

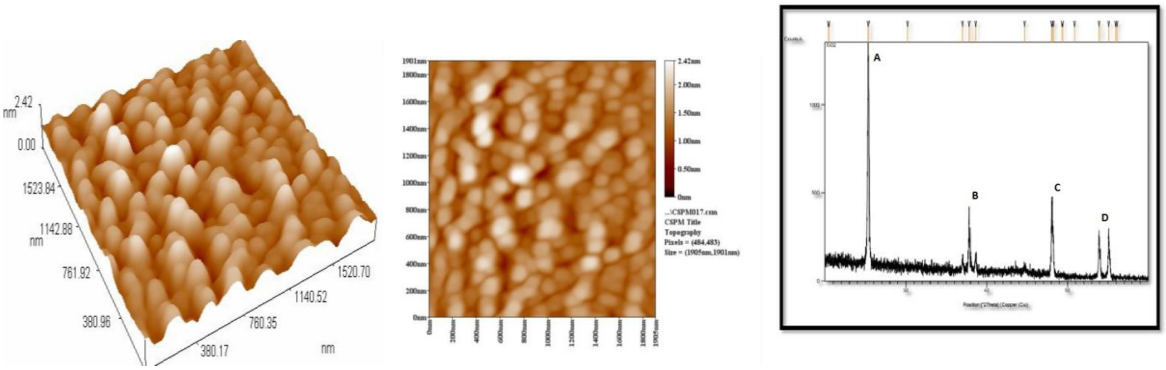

Figure (1): X-ray diffractogram and AFM of TiO_2 framework (Anatase)

Figure 2: Experimental configuration in Laser ablation in liquid setups where a focused beam irradiates; solid target placed in pure solution a colloidal solution a solution of nanoparticles

RESEARCH OBJECTIVES

Purpose of this study that the synthesis new model of nanocomposite by modify titanium dioxide for using and clearly observed as well as low-cost and eco-friendly revealed the presence of the "knock-down" growyh of pathogen baterai and how the combination of nanoparticles increase the anti-bathogen activity.

The aims of this work represented by:

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objectives
The aim of this work represented by:

- Preparing colloidal titanium dioxide nano composite by pulsed laser ablation technique in deionized water and synthesizing in this work,
- To performed laser ablation of Titanium target in water to synthesize colloidal Titanium oxide nanoparticles.
- To the detection surface morphology of the deposits, materials that have been studied by using atomic force microscopes (AFM). XRD pattern analysis to show that the average grain size and dimensions of Tio2
- Investigating the antibacterial activity of TiO2 nanotubes against four different pathogen bacteria Investigating of the best antibacterial activity concentration of both modify Nanocomposite in combination with titanium dioxide nanoparticles

MATERIALS AND METHODS

EXPERIMENT PROCEDURE

Synthesis of TiO2 Nano Powder
Nano - TiO_2 powder was synthesized via a Sol-Gel method using titanium tetraisopropoxide (TTIP), isopropanol and deionized water as starting materials. routines of TiO2 nanoparticles by Nd: YAG laser (1064 nm, pulse duration = 9 ns, repetition frequency 1Hz) operating at different Energies (80 and 200 mJ) for different ablation times (10, 20) min. Each sample was Heavy before and after ablation by a digital weigher to determine LAL titanium in distilled deionized plate

RESULTS

XRD diagrams (fig.1.D) show that the four synthesized samples have the highest diffraction peak in the crystalline plane (A) (2θ = 29.9202) and that the other diffraction peaks coincide with the crystalline phases of (B) (25.9348), (C) (25,3439) and the smallest vertex of E (33,9715). These results have shown that we can clearly see that the crystalline phase of each sample is manly in anatase form. this result correspondence with (1, 2). AFM spectra indicated (fig 1.A, B) the minute size distribution between (60-135 nm) for TiO_2 (anatase) and the minute size distribution between (50-150 nm), for TiO_2 doped with sb prepared at 873k. The results show that the TiO_2 doped with sb has the largest surface area, followed by TiO_2 (anatase) which has a smaller surface area compared to the decrease in particle size D Avg = 91.24nm and the dimer fig (1.C) high Z = 0.30 nm between the particles is 0.30 nm(1) found out goes with (1–3). The results also showed that a very significant difference between the groups studied ($P < 0.000$) showed that a high concentration in women was much higher than in the male, which confirms that the existence of the effect is generally an increase in the concentration carried out by exposure to nanoparticles. the result also showed that differences were found between the treatment group and the control group so that this finding agree with (3–5).

FINDINGS

Preparation method used led to getting titanium dioxide nanoparticles dimensions. modifying the band gap led to getting a smaller band gap (2.0eV) TiO_2- Sb. XRD, AFM crystal size, surface morphology and particle size and surface topography properties to all sample were proved the successful sights of the prepared compounds. The antibacterial activity of synthesized composite nanoparticles was tested against four different pathogen bacteria two

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gram negative (Escherichia coli (E.coli), Klebsiella pneumoniae (K. pneumoniae)),and two gram positive (Streptococcus pyogenes(S .pyogenes) and Staphylococcus aureus (S. aureus)) by two methods , the first method is liquid medium process in which different concentration of nanoparticles prepared in two laser energies 80mJ and 200 mJ then doping them with different iron oxide nanoparticles , the best results was obtained from the 400g.mL-1 of TiO2 nanoparticles doped with different ratios of nanoparticles .The composite nanoparticles that exhibited the best antibacterial activity in liquid medium method are tested by the second method the well diffusion method, and reveals that the best concentration of carbon nanotubes 400g.mL-1 that exhibit the best antibacterial activity are enhanced and become better when it doped with 43% nanoparticles.

REFERENCES

1. Wang T, Zhu YC, Sun ZX, Wu LG.(2015) Preparation of weak light-driven TiO_2 multi-composite photocatalysts via adsorption phase synthesis PAMAM templated N, Pt co-doped TiO2 for visible light photodegradation of brilliant black.
2. Wanazelee Wan Abu Bakar and Rusmidah Ali (2016) Optimization of photocatalytic degradation of polybrominated diphenyl ether on trimetallic oxide Cu /Ni /TiO_2 /PVC catalyst using response surface methodology method. Journal of the Taiwan Institute of Chemical Engineers. 62 (2016) 283–296
3. López-Muñoz D, Ochoa-Zapater MA, Torreblanca A, Garcerá MD.(2019) Evaluation of the effects of titanium dioxide and aluminium oxide nanoparticles through tarsal contact exposure in the model insect Oncopeltus fasciatus. Sci Total Environ. 2019 May 20;666:759-765.
4. Enza F., Marco S., Germana L. , Domenico F., Salvatore P., Paolo G. and Fortunato N.*," Iron oxide nanoparticles prepared by laser ablation: Synthesis,structural properties and antimicrobial activity*" , Colloids and Surfaces A: Physicochem. Eng. Aspects 490 98–103(2016).
5. Shu F. Situ and Anna Cristina S. Samia *," Highly Efficient Antibacterial Iron C stite Precursor Nanoparticles*" Appl. Mater. Interfaces, 6, 20154−20163, 2014