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A REVIEW ON: REDUCTION OF INORGANIC MATTER IN WASTEWATER THROUGH USE OF TITANIU DIOXIDE

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ABSTRACT

The aim of this research is to carry out the reduction of Inorganic Loading Rate in the wastewater by the use of Titanium Dioxide. Titanium Dioxide in powdered form belonging to nanoscale, gives higher surface area for the adsorption mechanism with the photocatalysis process under the UV lamp. Titanium Dioxide for treating wastewater with higher inorganic loading rate can lead to reduction with higher affectivity.

Keywords: Titanium Dioxide, Anatase, P_{25} Degusssa, Photocatalytic Adsorption, Inorganic Loading Rate.

I. INTRODUCTION

The population growth rate is increasing rapidly and at the same time new technology like nanotechnology is coming for future prospects [1]. Due to increase in population there is increment in industrialization for future needs and hence increase in inorganic waste may occur due to heavy increment in the industrialization [2]. Many times heavy inorganic waste may require separate treatment as its concentration maybe very high. As with time inorganic loading may increase which can cause harm to aquatic life when discharged into water bodies without giving the concerned treatment. So, the new arising technology can play role in dealing with environmental engineering [3]. The nanoscale powdered form Titanium Dioxide (TiO_2) can be used for treating the heavy inorganic loading rate containing wastewater. Anatase & P_{25} Degussa two types of TiO_2 can be used for this purpose under the ultraviolet (UV) radiation [4]. Anatase is one of the mineral forms of TiO_2 found in nature and P_{25} Degussa is the mixture of Anatase and Rutile, where Rutile is also the mineral form of TiO_2 found in nature where the composition of mixture of Anatase & Rutile may vary from 70:30 to 80:20 (Anatase: Rutile) [5]. These powders are insoluble in water and hence no further containment occurs of wastewater for its treatment [6]. When this nanoscale powdered form TiO_2 taken for the treatment of inorganic loading waste in the wastewater may give effective result in the photocatalytic reaction under UV light source.

II. MATERIALS & METHOD

2.1 Materials

2.1.1 Wastewater sample – The wastewater source from Galvanising industry in Pune

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2.1.2 Ultraviolet light source – Additional source of UV light for photocatalysis process with closed casing of wooden box so UV rays do not permeate through and come in direct contact with skin as UV rays are carcinogenic after extent of exposure

2.1.3 Titanium Dioxide – Anatase, P_{25} Degussa in nanoscale powdered form

2.1.4 Magnetic stirrer – Magnetic stirrer to provide adequate stirring in the solution so that the insoluble powder uniformly gets distributed throughout the solution

2.2 Method

Taking the P_{25} Degussa/ Anatase in the wastewater and mixing it by magnetic stirrer, thus the solution can be made of TiO_2 and wastewater. By exposing this solution in the UV light, the process undergoes photocatalytic reaction of:

$$TiO_2 \xrightarrow{\text{uv light}} e^-_{cb}(TiO_2) + h^+_{vb}(TiO_2) \quad (1)$$

Where, cb is conduction band and vb is valence band [7]. After the process is completed taking the supernatant treated wastewater, as the TiO_2 gets settled at the bottom. The supernatant would be taken for inorganic loading test

III. DISCUSSION

In this research the reduction of inorganic loading rate obtained under the photocatalytic adsorption phenomenon of TiO_2 is studied. The study will be conducted to determine the following:

- To find the optimum timing and optimum dosage for better affectivity
- To comparatively find the effectiveness of both P_{25} Degussa and Anatase

IV. CONCLUSION

The maximum efficacy can vary for different concentrations with different timing of exposure under UV light. Highest amount of efficiency can be achieved for reduction of inorganic loading rate with the help of Titanium Dioxide.

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REFERENCES

[1] Xiaolei Qu, Pedro J.J. Alvarez, Qilin Li, 2012 *Applications of Nanotechnology in Water and Wastewater Wreatment, Int. J. Science Direct. 47 3931 – 3946*

[2] Jatin G. Bhadiyadra1, Minakshi V. Vaghani, 2015 *A Review on Applicability of Photo-catalyst Titanium dioxide for Treatment of Grey water, Int. J. Engineering Research and Applications 5 102 – 105*

[3] Xiaojia Wan, Ting Wang, Yamei Dong and Dannong He, 2004 *Development and Application of TiO2 Nanoparticles Coupled with Silver Halide, Int. J. of Nanomaterials Vol. 2014 pp 5*

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

[4] Ming Hua, Shujuan Zhang, Bingcai Pan*, Weiming Zhang, Lu Lv and Quanxing Zhang, 2011 *Heavy Metal Removal From Water/Wastewater by Nanosized Metal Oxides: A Review, Int. J. of Hazardous Materials Volume 2012 pp 317-331*

[5] B. Ohtani, O. O. Prieto-Mahaney, D. Li and R. Abe, 2010 *What is Degussa (Evonik) P25? Crytalline Composition Analysis, Reconstruction From Isolate Pure Particles and Photocatalytic Activity Test, J. of Photochemistry and Photobiology A Chemistry Volume 216, pp 179-182*

[6] Teruhisa Ohno, Koji Sarukawa, Kojiro Tokieda and Michio Matsumura, 2001 *Morphology of a TiO_2 Photocatalyst (Degussa, P-25) Comsisting of Anatase and Rutile Crystalline Phases, J. of Catalysis Volume 2001 - 203, pp 82-86*

[7] Deanna C. Hurum, Alexander G. Agrios and Kimberly A. Gray, 2003 *Explaining the Enhanced Photocatalytic Activity of Degussa P25 Mixed-Phase TiO_2 Using EPR, J. Phys. Chem. B 2003 Volume 107, pp 4545-4549*

[8] Song¨ul KARAASLAN AKSU1, S¸eref G¨UC¸ER, 2010 *Investigations on Solar Degradation of Acid Orange 7 (C.I. 15510) in Textile Wastewater With Micro and Nano Sized Titanium Dioxide, Turkish J. Eng. Env. Sci. 34 275 – 279*

[9] Chitpisud Supha, Yuphada Boonto, Manee Jindakaraked, JirapatAnanpattarachai & Puangrat Kajitvichyanukul, 2015 *Long-term Exposure of Bacterial and Protozoan Communities to TiO_2 Nanoparticles in an Aerobic Sequencing Batch Reactor, Int. J. Science and Technology of Advanced Materials 16 pp 12*

[10] Ruiqun Chen, Jie Han, Xiaodong Yan, Chongwen Zou, Jiming Bian, Ahmed Alyamani, Wei Gao, 2011 *Photocatalytic Activities of Wet Oxidation Synthesized ZnO and ZnO –TiO2 Thick Porous Films, Int. J. Applied Nanosci 1 pp 37 – 44*

[11] Haithem Bel Hadjltaief, Abdessalem Omri, Mourad Ben Zina, Patrick Da Costa and Maria Elena Galvez, 2015 *Titanium Dioxide Supported on Different Porous Materials as Photo-catalyst for the Degradation of Methyl Green in Wastewaters, Int. J. Advances in Material Sci. and Eng. Volume 2015 pp 10*

[12] Harikumar PS*, Litty Joseph and Dhanya A, 2013 *Photo-catalytic Degradation of Textile Dyes by Hydrogel Supported Titanium Dioxide Nano-particles, J. of Environmental Engg. And Ecological Sci. Article*