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Reduction in Inorganic Loading Rate in Dairy Wastewater through Use of Nanomaterials: Zinc Oxide and Mixture of P_{25} Degussa & Zinc Oxide

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Abstract: ***The aim of this research is to carry out the reduction of Inorganic Loading Rate in Dairy wastewater by the use of nanomaterials: Zinc Oxide and mixture of P_{25} Degussa & Zinc Oxide. All these reagents belonging to nanoscale gives higher surface area for adsorption mechanism with the photocatalysis process under the Ultraviolet lamp. By this research thesis we can find relative efficiency of treating inorganic waste in the wastewater.***

Keywords: Zinc Oxide, P_{25} Degussa, Photocatalytic adsorption, Inorganic Loading Rate

1. Introduction

The wastewater growth rate is increasing day by day in the dairy industry with increase in the population demand for dairy products. The upcoming technology is nanotechnology. Making use of nanotechnology in environmental engineering field leads to a new prospect [1]. By using nanoscale powders for treatment of inorganic loading rate in dairy wastewater leads to higher efficiency for removal of inorganic loading waste [2]. Use of P_{25} Degussa which is the mixture of nanoscale Titanium dioxide minerals Anatase & Rutile i.e. 70 to 80% and 30 to 20% respectively with Zinc Oxide (ZnO) and Zinc Oxide singly in nanoscale for the treatment of dairy wastewater [3]. These powders are insoluble in water solution and hence can be separated easily from the wastewater after the treatment [4]. Taking comparative study for ZnO and mixture of P_{25} Degussa & ZnO, we can found effectiveness of both for treating inorganic loading rate in dairy wastewater.

2. Apparatus &Materials

2.1 Wastewater Sample – Wastewater source from Dairy Industry in Pune
2.2 Ultraviolet Light Source – Additional source of UV light for photocatalysis process with closed casing of wooden box so UV rays do not penetrate outside and come in direct contact with skin as UV rays are carcinogenic after extent of exposure
2.3 Zinc Oxide – ZnO in nanoscale powdered form
2.4 Mixture of ZnO and P_{25} Degussa – ZnO and P_{25} Degussa in nanoscale form mixed as 1:1 ratio form
2.5 Magnetic stirrer – Magnetic stirrer to provide adequate stirring in the solution so that the insoluble powder uniformly gets distributed throughout the solution

3. Methodology

Taking both the reagents for different concentrations of 0.3gms, 0.5gms, 0.7gms & 0.9gms per 500ml dairy wastewater and making solutions. These solutions are mixed thoroughly by using magnetic stirrer apparatus so the powder gets uniformly distributed in the solution. Taking this uniformly mixed solution and exposing them for 24hours under the UV box for the process to undergo photocatalytic adsorption reaction [5]. After the process is completed take the supernatant treated wastewater for inorganic loading rate test i.e. COD test.

4. Results

ZnO showing maximum effectiveness for 0.9gms/500ml solution i.e. Dairy wastewater with 828 mg/l inorganic loading rate reduced to 165.6mg/l and efficacy of 80% in 24hours of exposure under UV light, while mixture of ZnO and P_{25} Degussa too showing maximum effectiveness for 0.9gms/500ml dosage which reduced to 184mg/l with efficacy of 77.78% in 24hours of UV light exposure.

5. Conclusion

With increase in concentration of reagent there is decrease in the inorganic loading rate in the dairy wastewater for both reagents. In comparative study of both reagents ZnO works with higher affectivity for reducing inorganic loading rate in dairy wastewater.

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