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Wastewater treatment using non-conventional coagulants and flocculants

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ABSTRACT

The prevailing most widely used method for coagulation and flocculation are dosages of Alum, copperas, lime, ferric chlorides, the contaminants removal efficiency from above given Methods are not cost effective. Therefore the present study focuses on use of different coagulants and flocculants such as non-conventional to reduce the contaminants from the wastewater. Various parameters (includes pH, COD, TDS, TSS, NH4N-, TOC) are to be studied before and after treatment with non-conventional coagulants and to find out the effect of these coagulants on various effluents. These coagulants are compared with each other and way results in higher removal efficiency of contaminants.

KEYWORDS | coagulants and flocculants

I. INTRODUCTION TO WASTEWATER

Industrialization has led to pollution and consequently environmental degradation due to the release of pollutants to water bodies, land and/or air. One of these pollutant sources is industrial wastewater. Many industries consume fresh water and release wastewater as exhaust. Wastewater is not just one of the main causes of irreversible damages to the environmental balances but also contributing to the depletion of fresh water reserves in this planet.

Wastewaters from chemical industries are characterized by the presence of heavy metallic ions, chemical contaminant and turbidity. Exposure to lead (Pb), for example, is recognized as a major risk factor for several human diseases, and the structure of industrial ecological systems have made exposure to Pb unavoidable for most people alive today. The removal of these toxic metals and contaminants from industrial wastewater is a matter of great interest in the field of water pollution, which is a serious cause of water degradation [1].

Textile wastewater pollutants are generally caustic soda, detergents, starch, wax, urea, ammonia, pigments and dyes that increase its BOD, COD, solid contents and toxicity. Coagulation is an essential process in the treatment of industrial wastewater[2].In dairy, wastewater is often discharge intermittently. Dairy wastewaters are characterized by high biochemical oxygen demand (BOD) and chemical oxygen demand (COD) concentrations. Chemical oxygen demand (COD), which is normally about 1.5 times the BOD level, It also contains total solids, total dissolved solids, nitrogen and phosphorous. Important indicators for the quantification of organic load of dairy plant effluents are biological oxygen demand (BOD), chemical oxygen demand (COD), the ratio of COD to BOD indicates the biodegradability of organic materials under aerobic or anaerobic condition. [3]

II. PREPARATION OF NATURAL COAGULANT

Tamarind seeds were collected from a tamarind tree available at staff quarters of Abu-Bakr Tafawa Balewa University, Bauchi, Nigeria. The tamarind seeds were soaked for about 24 hr. before they were washed to separate the seeds from the pulp and rewashed to remove adhering pulps. The seeds were dried under atmospheric temperature first and, then, inside an oven for about eight (8) hours at 50 °C. This was carried out thus so as to make the tamarind seeds easy to been crushed. The crushing of the seeds was carried out for size reduction using mortar and pestle. The crushed seeds were ground using a blender to produce the tamarind seed powder that was sieved to form medium fine powder used as the coagulant [1].

The seed pods of Cicer arietinum, Dolichos lablab, Moringa oleifera and T.foenum-graecum are collected, and dried naturally by sunlight. And remove the seeds from the pod manually. The dried seeds were ground to fine powder by domestic blender. This powder was sieved through 600µm sieve[3].

III. EXPERIMENTAL METHODOLOGY

All coagulation experiments were carried out by using a conventional jar test apparatus.

Jar test is the most widely used experimental methods for coagulation-flocculation. A conventional jar test apparatus was used in the experiments to coagulate sample of turbid water using natural coagulant. It was carried out as a batch test, accommodating a series of six beakers together with six- spindle steel paddles. Before operating the jar test, the sample was mixed homogenously. Then, the samples ought to be measured for turbidity, for representing an initial concentration. Coagulants of varying concentrations were added in the beakers. The whole procedures in the jar test were conducted in different rotating speed [4].

Optimization of M. oleifera, T. indica and S. potaturum dosage using jar test: The optimization for M. oleifera, T. indica, S. potatorum and alum dosage were performed using the jar test apparatus. The apparatus permitted four beakers to be agitated all together. 0.5 L of textile wastewater were dosed with 10, 20, 40, 60 and 80 mL of natural coagulants were stirred rapidly for 10 min at 180 rpm, followed by 10 min slow stirring for flocculation. The coagulant dosage can be selected depending on the turbidity of wastewater. Floc formation can be observed throughout this time. Flocs were permitted to settle for one hour before obtained for samples analysis. These procedures are performed for several times so that the optimum pH and dosage of coagulant can be calculated17,18. After settling, 30 mL of the sample was taken from the middle of each beaker using a pipette and placed in small beaker for further analysis[2].

I. CONCLUSION

The characteristics of untreated dairy wastewater are pH 7.41, conductivity-2.21mS/cm, COD-10000 mg/l, BOD2250 mg/l, total solids-2033 mg/l, suspended solids- 1200 mg/l, dissolved solids-833 mg/l, Turbidity-289.5 NTU. The optimum dosage of T.foenum-graecum, Moringa Oleifera, Cicer arietinum and Dolichos lablab seed powder as a coagulant is found to be 0.05/500ml, 0.1gm/500ml, 0.1gm/500ml and 0.05gm/500ml respectively. The

optimum pH of T.foenum-graecum, M.oleifera, C. arietinum and D.lablab are found to be 8, 9, 10, 7.41 respectively. Among the three natural coagulants, the maximum reduction of turbidity and COD is found to be 78.33% and 83% with Cicer arietinum; hence the Cicer arietinum is more effective for treatment of dairy wastewater[3]. At constant pH and time, the increase in coagulant dosage was observed to cause increasein the turbidity and COD removal efficiency. The optimum dosage was obtained to be 400 mg/L for coagulation at optimum pH of 7.25 and mixing speed of 3 minutes of rapid mixing and 15 minutes of slow mixing. Therefore, the optimum pH, mixing time and coagulant dosage for the treatment of the detergent wastewater have been obtained to be 7.25, 140 rpm for 3 min and 40 rpm for 15 min and 400 mg/L, respectively[1].

REFERENCES

[1] Ronke Ruth Ayangunna1, Saidat Olanipekun Giwa2*, Abdulwahab Giwa3, "Coagulation-Flocculation Treatment of Industrial Wastewater Using Tamarind Seed Powder" International Journal of ChemTech Research , Vol. 9, No.5, 2016, pp.771-780.

[2] N. Muralimohan* And T. Palanisamyparmjit," Treatment of Textile Effluent by Natural Coagulants in Erode District" Department of Civil Engineering, K.S.R. College of Engineering,India, vol. 26, No. 3, pp. 911-914.

[3] Prof. Chidanand Patil1, Ms. Manika Hugar2,"Treatment of dairy wastewater by natural coagulants" International Research Journal of Engineering and Technology, Vol. 02. , No. 2 2015,pp. 1120–1125.

[4] T.Phani Madhavi1*, R. RajKumar2," Utilisation Of Natural Coagulant For Reduction Of Turbidity From Waste water ", National Conference on Industrial Pollution And Control Technology-2013 , Vol.5, No.3, pp 1119-1123.