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The Influence of the Composition of a Mixture of Hydrocarbons on the Mineralization by a Solar Process

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ABSTRACT

Wastewater discharged from petrochemical sectors needs further treatment since the processes used remain insufficient to attend the required purification, this study aims to show the difference between wastewater recovered from a petrochemical center and a synthetic prepared solution of toluene in water, using solar rays in order to decrease hydrocarbons concentration in water. The results of the solar degradation of toluene content in synthetic solution showed a chemical oxygen demand (COD) reduction rate of 77.97% after 4 hours of treatment, while the reduction rate of the COD of wastewater treatment has reached 35.51%

Keywords: Wastewater, treatment, hydrocarbons, solar energy.

1 Introduction

Enviromental protection has become nowadays attention, Wastewater treatment is an essential procedure that is vital to maintaining the sustainability of water supplies, preserving the environment, and preserving human health. using solar rays as a solution to depollute water from impurities like hydrocabons (light or heavy ones) has become among the technological techniques. The primary objective of this study is to transform contaminated water into a form that meets specific quality standards by testing the performance of solar irradiations on two types of waters, the first one is a synthetic solution prepared at the laboratory while the second one is recovered from a petrochemical center and both have given a reduction rate.

2 Experimental

In this section, the equipments, methods and materials are discussed:

2.1 Materials and Methods

2.1.1 Treated solutions:

- **Synthetic Solution**: Toluene, also known as toluol, is a substituted aromatic hydrocarbon. It is a colorless, water-insoluble liquid with the smell associated with paint thinners. It is a mono-substituted benzene derivative, consisting of a methyl group (CH3) attached to a phenyl group. As such, its systematic IUPAC name is methylbenzene. Toluene is predominantly used as an industrial feedstock and a solvent. [1]

The toluene aqueous solution of 20ppm was firstly prepared by adding 23 µl of toluene to distiller water, followed by rapid stirring.

- **wastewater solution:** Recovered from petrochemical producing center
- **Experimental devise:** The solar degradation experiments were conducted in batch photo reactor. The reactors were exposed to solar rays source for 4 hours. Constant slow agitation was assured by means of a magnetic stirrer placed at reactor base.

2.1.2 Methods: Analytical protocol

Toluene **solution:** The UV absorption peak (figure 1) at 600 nm was chosen for developing the COD standard curve and calculating the degradation efficiency of toluene.

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The toluene degradation efficiency can be written as:

$$R\,(abatement\ rate)\% = \frac{(COD)_0 - (COD)_F}{(COD)_0} * 100$$

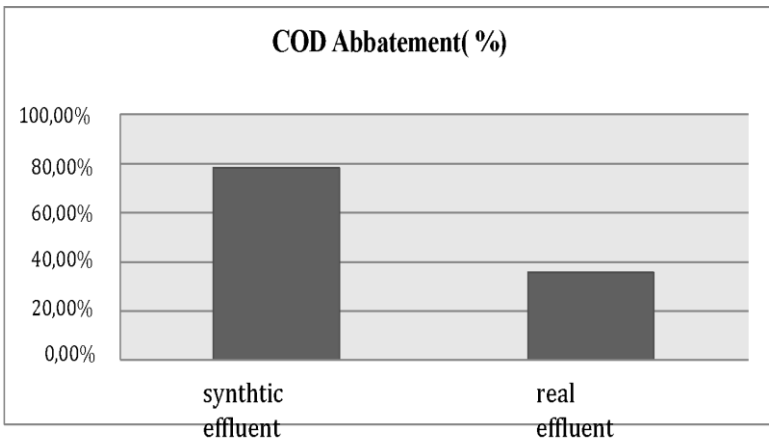
- **Real effluent:** COD test tubes (figure 2) where used to detect the load of the matter present in the solution so the abatement rate after water treatment is calculated by equation 1.

Figure1: Visible ultraviolet Equipment

Figure2: COD test tubes

3 Results and Discussion

The COD of synthetic toluene solution increased during the first 3h, then it decreased. Based on COD analysis, the toluene degradation efficiency was calculated to be 77.97% after 4 hours of treatment while the COD measurement for the real effulent achieve 35.51%.



4 Conclusions

The addressing parameter in this study was the chemical oxygen demand (COD) in order to to investigate the degradation of hydrocarbons in both aqueous solutions. According to the obtained results, it was found that solar rays decrease the COD of toluene solution and wastewater solution with different percentages and this can be explained by the organic and inorganic substances present in water

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