SIIC095

A REVIEW ON THE MINERALIZATION OF ORGANIC POLLUTANT BY USING PEROVSKITE CATALYST

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Abstract:

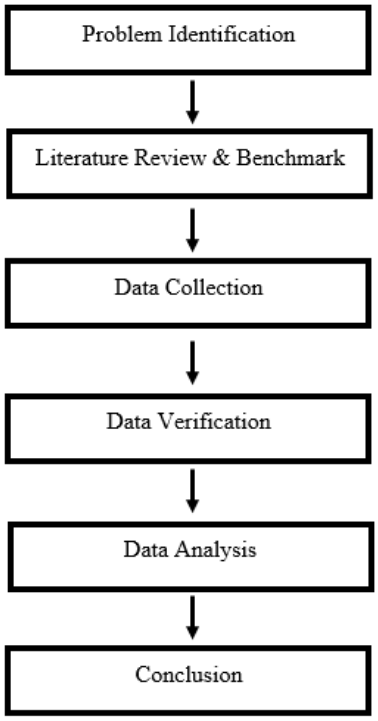
This study aspires to have an improvement of Advance Oxidation Process (AOPs) to degrade organic pollutants. Currently, AOPs need chemical additives and additional energy that is not economically. Perovskite catalyst have been introduced to degrade existing organic pollutants preferred to economic saving and feasible operation. This study therefore aims to review the mineralization of organic pollutants using perovskite catalyst by Total Organic Compound (TOC) analysis and to review the intermediate compound presence during catalysis by High Performance Liquid Chromatograph (HPLC). Methodology of research review including identify the problem, literature review, data collection, data verification, data analysis and conclusion. Zinc Oxide (ZnO) perovskite catalyst used to degrade 4 types of dyes solution which are yellow 145 dye, black 5 dye, Red 4 dye, and Blue 21 for initial time, 30 minutes and 2 hours for mineralization process. Graphical presentation of the study shows that the longer the time taken for mineralization process, the higher the mineralization rate. The present study demonstrates that the ZnO type of perovskite catalyst is an efficient and feasible method to treat textile wastewater. TOC removal in degradation of azo II dye solution using calcium strontium copper (CSC) based catalyst under dark condition without any ozone or peroxide has been studied. The content of Ca and Sr in the A-site of the perovskite structure was varied whilst the B-site was Cu rich. CSC compounds with higher Ca content in the A-site were slightly more effective at degrading OII. In order to understand further the by-product formation during the catalytic activity, the HPLC analysis carried out for OII dye solutions degradation from 0 to 240 minutes. The highest intermediate compound that exist in the reaction are at mass-to-charge ratio of 327.04 m/z which is C10H11N2O4S. As for the contact time increase, more reactant adsorbed on the catalyst surface.

***Keywords*:** Perovskite catalyst, HPLC, Organic pollutant, Mineralization, Advance Oxidation Process (AOPs)

Objectives:

- The project has the following objectives:
- To review the mineralization of organic pollutants using perovskite catalyst
- To review the intermediate compounds presence during the catalysis

Methodology:



Results:

Table 1: TOC removal of waste water treatment in 9hrs

Photocatalyst	Color Removal (%)	COD (%)	TOC Removal (%)
TiO_2 P-25/ Cu	98	97	89
TiO_2 P-25	94	42	72
UV/ H_2O_2	92	26	55

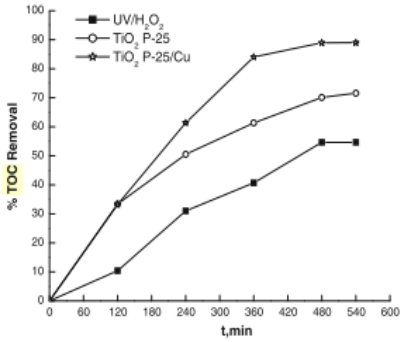


Figure 1: Effeciency removal of organic matter in wastewater

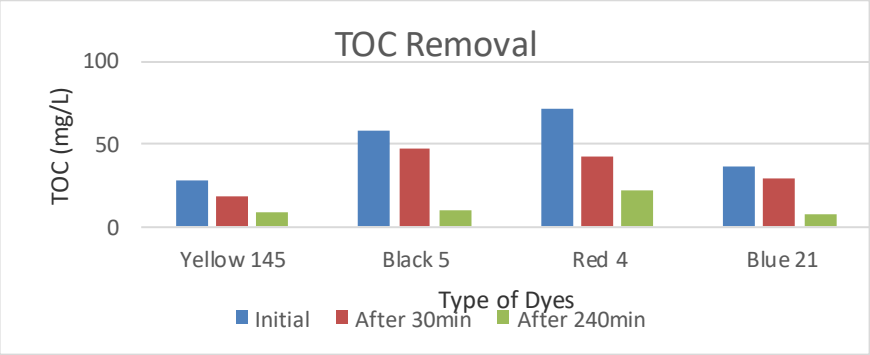


Figure 2: TOC removal of dye solution wastewater using ZnO perovskite catalyst

Conclusion:

This study has revealed that the mineralization process of organic pollutant by using perovskite catalyst is an extremely efficient in terms of performances and economical aspect especially in wastewater treatment. Results indicate that the mineralization process of degrading organic pollutant in waste water treatment may achieve higher performance when using perovskite catalyst. The reaction rate as well as the mineralization rate have achieved a remarkable performance with the presence of perovskite catalyst as compared to a process without using the perovskite catalyst. Interestingly, the results obtained for the mineralization rate of the organic pollutants using perovskite catalyst photocatalytic activity indicates higher mineralization rate for 2 hours contact time than the photocatalytic treatment that being operated for 9 hours contact time. This is because the different type of perovskite catalyst promotes different result of degradation. However, based from experiment that using TiO_2 perovskite catalyst shows that the degradation process without using any perovskite catalyst is much lower performance rather than the other two ways which using perovskite catalyst. This can conclude that perovskite catalyst gives huge effects in degradation of organic pollutants. Some photocatalytic studies implement the use of TiO_2 as a semiconductor. Anyhow, ZnO is considered having much higher electron mobility than TiO_2 which conquer higher efficiency in electron transfer. Photocatalyst treatment require light and energy in order to degrade the organic pollutants but not for perovskite catalyst which is beneficial in terms of economical aspect. The intermediate compounds exist during catalysis process have been identified as Oxygen, Sulphur, Nitrogen, Carbon and Hydrogen. The degradation process characterized by bond breakdown. The degradation process was happened partially that leads to the formation of byproducts identified by HPLC.