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Degradation of Palm Oil Mill Effluent (POME) using $FeCl_3$ as a Catalyst

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Structured Abstract

Background: Palm oil mill effluent (POME) is a highly polluting waste product produced during palm oil production and if not been treated properly can causes harmful to the environment. The utilisation of $FeCl_3$ has a promising potential as an effective catalyst for POME degradation.

Methods: The 250mL of POME sample was diluted by adding 750mL of deionized water. The pH of sample was adjusted to acidic (pH 4-6) and alkaline (pH 8-10) condition by used 0.1M HCl and 0.1M NaOH. To degrade the organic compounds contained in POME sample, 0.005M of $FeCl_3$ which is about 10mL was added to the 40mL of POME during preparation. The temperature of the samples was varied to 25°C, 40°C, 50°C, 60°C, 70°, 80°C and 90°C. The temperature with 15 and 30 minutes of digestion time was studied to analyse the effect of temperature on its effectiveness to degrade the organic compounds. The samples were analysed using UV-Vis spectroscopy.

Results: The results revealed that both temperature and pH condition had a significant impact on POME degradation. The degradation was favourable at higher temperature and in alkaline condition. Upon addition of $FeCl_3$ which act as a catalyst, the degradation occurred at temperature of 80°C in acidic condition, while in alkaline condition the degradation occurred at temperature of 90°C with 30 minutes digestion time. The presence of $Fe(OH)_3$ precipitates in the alkaline condition significantly improves the degradation process. These precipitates act as effective adsorbents, leading to the removal of impurities and organic compounds, resulting in a visibly clearer sample solution.

Conclusion: $FeCl_3$ was an effective catalyst for the degradation of POME. Alkaline condition with higher temperature and longer digestion time was found to be effective condition to degrade POME. This is due to the clear solution of sample after degradation and the presence of precipitates.

Keywords: Palm oil mill effluent, Ferric chloride, catalyst, UV-Vis spectroscopy

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