

Potential effect of using ultrasonic irradiation to reduce concentration of COD in Palm Oil Mill Effluent (POME)

ABSTRACT

Many researchers have attempted in the past to look at the possibility of using ultrasonic irradiation or sonication in degrading organic compounds in aqueous wastewater. Ultrasonic irradiation was found to be a safe, clean and effective method for deterioration of specific organic compounds. Ultrasonic irradiation can be used as a stand-alone process, or can be integrated with other treatment methods. However, very limited study focuses on the application of ultrasonic irradiation for treating industrial wastewater; therefore, it is considered as a new research. When water is exposed to ultrasonic irradiation, $\cdot\text{H}$ and $\cdot\text{OH}$ radicals are produced; the latter is a strong oxidizing agent which can degrade organic pollutants. This study uses raw Palm Oil Mill Effluent (POME) as a test media to investigate the effectiveness of ultrasonic irradiation in reducing organic compounds based on the Chemical Oxygen Demand (COD) concentration at selected operating conditions, namely power density of ultrasonic probe and addition of catalysts. Results showed percentage reduction of COD was highest at power density 29W/L than power density 55W/L. Power density 29W/L of ultrasonic probe chose to combine with catalysts. Application of ultrasonic irradiation with presence of the catalysts CuSO_4 and FeSO_4 , increased the percentage of COD reduction, but FeSO_4 gave a better result. The highest percentage reduction of COD of raw POME is around 30% after ultrasonic irradiation process combined with the catalyst FeSO_4 .

Keyword: Environmental Sciences Journal; Ultrasonic irradiation; Palm Oil Mill Effluent; POME; Agricultural industry; Palm oil production; Ultrasonication; Sonochemical applications; Sonochemistry theory; Palm oil plantations; Sonochemical decomposition; Organic pollutants