

**DEVELOPMENT OF NEW HYBRID ADSORPTION
COAGULATION METHOD FOR PALM OIL MILL WASTEWATER
TREATMENT**

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Abstract

Activated carbon has been using as an adsorbent for wastewater treatment for decades. It has also been reported that use of fly ash to adsorb impurities in waste water treatment. The main objective of this study is to optimize hybrid adsorption-coagulation method for removal of color, BOD, COD, TDS, TSS and Turbidity presence in palm oil mill effluent (POME). Mango pit is a natural environmental friendly coagulant and have many advantages over commercially available aluminum and ferric salts used for water and wastewater treatment. Fly ash has the proficiency to be recycled and used various times. This study further investigates the combination of fly ash with mango pit. Three sets of experiments were performed using jar test method namely; only adsorption using fly ash and the second is using mango pit as coagulant and the third one is using fly ash in combination with mango pit in hybrid adsorption-coagulation system. In the first set of experiments only adsorption process was studied using fly ash as an adsorbent by varying particle size and weight. Samples of 300ml wastewater were used with variable fly ash particle size ranging from 355 μ m and 500 μ m and operated at 200rpm. Results showed that with decrease in particle size the amount of pollutant adsorbed increased, therefore process was optimized using 355 μ m granule size and 90g of dose produced results in color reduction as 91%, COD 82%, BOD₅ 83%, TDS 74%, TSS 78% and turbidity 93% respectively. In second set of experiment mango pit was proved to be an excellent coagulant to be used for wastewater treatment which gave reduction of pollutants up to 70%. Further in the third set of experiments equal amount of wastewater samples were investigated using hybrid adsorption-coagulation method by varying concentration and pH of adsorbent-coagulant as (50g-0.6ml, 70g-0.8ml, 90g-1.2ml). When applying hybrid method an improved trend was recorded comparing with previous results in reduction of Color from 91% to 97%, COD from 82% to 89%, BOD from 83% to 94%, TDS from 84% to 93% and TSS from 88% to 96% respectively. Hybrid coagulation-Adsorption method has not only positive impact on reduction of wastewater quality parameters but also very cost effective and environmental friendly process. Other advantages include low sludge production and the less amount of coagulants used.

Key words: POME, Hybrid, Fly ash, Coagulation, Adsorption

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Nomenclature

List of abbreviations

POME	Palm oil mill Effluent
POBFA	Palm oil mill boiler fly ash
COD	Chemical Oxygen Demand
BOD	Biological oxygen demand
TDS	Total dissolved solid
TSS	Total suspended solid
FFB	Fresh fruit bunches.
CPO	Crude palm oil



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