Treatment of palm oil mill effluent using electrocoagulation powered by direct photovoltaic solar system

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ABSTRACT

High commercial electricity consumption is one of the disadvantages in the operation of lengthy electrocoagulation processes. To cater to this problem, this study develops an integrated photovoltaic-electrocoagulation system in treating oil palm mill effluent (POME). This system has successfully reduced 23,837 mg/L of chemical oxygen demand (COD) and 15,153 mg/L of biological oxygen demand (BOD) in 8 h. It was found that the higher solar radiation harvested by photovoltaics produces a higher current intensity, which in turn generates more in-situ coagulants into the wastewater. This relates to COD and BOD removal's significance from 150 to 390 min, where the current intensities are in the maximum range (between 153–181 mA). The first-order kinetic models of COD and BOD are in good correlation coefficient, which is 0.9873 and 0.9837, respectively. Overall, this study findings recommend the possibility of sustainable operation in the actual wastewater pond.

KEYWORDS

Electrocoagulation; Photovoltaic; Palm oil mill effluent; Chemical oxygen demand; Biological oxygen demand; Solar radiance

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