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Electrocoagulation treatment of raw palm oil mill effluent: Optimization process using high current application

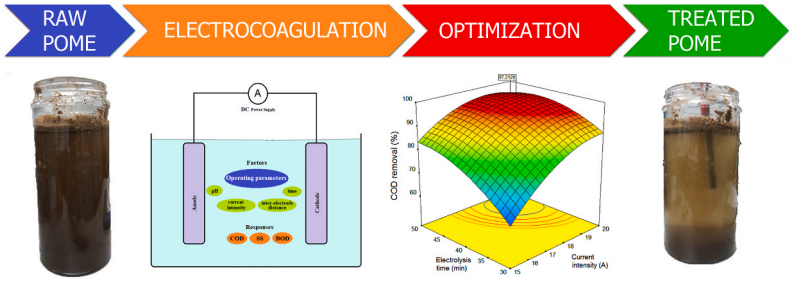
Mohd Nasrullah [a], Sabah Ansar [b], Santhana Krishnan [c], Lakhveer Singh [d,e], Shaik Gouse Peera [f], A.W. Zularisam [a,*]

[a] Faculty of Civil Engineering Technology, Universiti Malaysia Pahang (UMP), Lebuhraya Tun Razak, 26300, Gambang, Kuantan, Pahang, Malaysia
[b] Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, King Saud University, P.O. Box 10219, Riyadh, 11433, Saudi Arabia
[c] PSU Energy Systems Research Institute, Department of Civil Engineering, Faculty of Engineering, Prince of Songkla University, Hat Yai, Songkhla, 90110, Thailand
[d] Energy Cluster, School of Engineering, University of Petroleum and Energy Studies (UPES), Energy Acres, Via Premnager, Dehradun 248007, India
[e] Department of Civil Engineering, Centre for Research & Development, Chandigarh University, Mohali, 140413, Punjab, India
[f] Department of Environmental Science and Engineering, Keimyung University, Daegu, 42602, Republic of Korea

HIGHLIGHTS

- Relationship between independent-dependent variables show a good result in R^2.
- ANOVA shows most of the models are significant.
- Experimental results and estimated result from the model were in close agreement.
- Effect of correlation can boost its performance.

GRAPHICAL ABSTRACT



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ABSTRACT

In the electrocoagulation wastewater treatment process, extremely polluted water treatment requires an effective technique, and using high current is one of those. This study aims to optimize electrocoagulation parameters such as operation time, electrodes gap and the initial pH by applying high current intensity to treat palm oil mill effluent (POME) via Box–Behnken design (BBD) method. Chemical oxygen demand (COD), biological oxygen demand (BOD), and suspended solids (SS) were used as the response variables in the quadratic polynomial model. Most of the selected models in the analysis of variance (ANOVA) have shown significant results. A high connection between the parameters and dependent variables was surprisingly discovered in this study which the obtained value of R^2 for removal percentage of COD, BOD and SS were 0.9975, 0.9984 and 0.9979 respectively. Optimal removal was achieved at 19.07 A of current intensity (equivalent to 542 mA/cm^2 of current density), 44.97 min of treatment time, 8.60 mm of inter-electrode distance and 4.37 of pH value, resulted in 97.21%, 99.26% and 99.00% of COD, BOD and SS removal respectively. This optimized scheme of operating parameters combination offers an alternate choice for enhancing the treatment efficiency of POME and also can be a benchmark for other researchers to treat highly polluted wastewater.

* Corresponding author. Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300, Gambang, Kuantan, Pahang Darul Makmur, Malaysia.
E-mail addresses: zularisam@ump.edu.my, zularisam@gmail.com (A.W. Zularisam).

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