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Continuous electrocoagulation treatment system for partial desalination of tropical brackish peat water in Sarawak coastal peatlands

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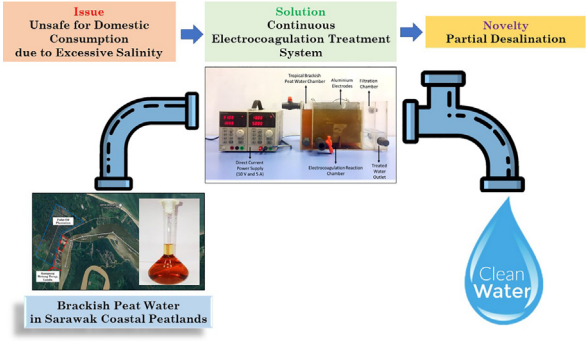
HIGHLIGHTS

- Partial desalination of brackish peat water with continuous electrocoagulation
- Utilization of brackish peat water for domestic consumption in Sarawak
- Salinity reduction with adsorption process in electrocoagulation
- Low energy operating cost

GRAPHICAL ABSTRACT

Partial desalination of tropical brackish peat water with continuous electrocoagulation treatment system.



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ABSTRACT

Sarawak coastal peatlands located on Borneo Island have vast availability of brackish peat water sources especially in some coastal rural areas. However, brackish peat water is currently underutilized as the source for water treatment plants due to excessive salinity levels. As such, this study aims to investigate the salinity reduction in brackish peat water sources for domestic consumption in Sarawak coastal peatlands by utilizing continuous electrocoagulation treatment with aluminium electrodes. Correspondingly, this study analyzes the effects of salinity percentage, electric current, and flow rate on salinity reduction with electrocoagulation treatment. This study has found that the treated salinity levels in brackish peat water with 30 % of salinity percentage meet the Malaysia Class I in National Water Quality Standard. The study has also identified both monolayer and multilayer adsorption that occurs in electrocoagulation treatment as the precursor to salinity reduction. In addition, the presence of in-situ aluminium hydroxide coagulants could adsorb some sodium chloride from brackish peat water with 70 % of salinity percentage at 2503 mg/g of maximum adsorption capacity and 2.65 min^{-1} of adsorption rate. This study has also found that electrocoagulation treatment could achieve 91.78 % of maximum salinity reduction efficiency at an optimum electric current of 5 A and flow rate of 1.2 L/min in brackish peat water with 30 % of salinity percentage. This treatment system costs only Ringgit Malaysia (RM) 0.29 or United States Dollars (USD) 0.06 per meter cubic of treated brackish peat water. Overall, this study demonstrates that continuous electrocoagulation treatment could partially desalinate brackish peat water with 30 % of salinity percentage in which the treated salinity levels could be utilized for domestic consumption in Sarawak coastal peatlands at reasonable cost.

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