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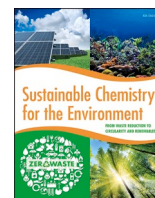
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Treatment of tropical peat water in Sarawak peatlands nature reserve by utilising a batch electrocoagulation system

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ABSTRACT

Tropical peat water is abundantly available in peatlands nature reserve, especially on Borneo Island. However, this water source contains humic substances that could be harmful to human health if consumed without undergoing water treatment process. Although tropical peat water could be treated with conventional treatment, the system possesses drawbacks in terms of debris build-up in pipeline networks. As such, this study aims to develop a batch electrocoagulation treatment system to treat tropical peat water for domestic consumption in Sarawak peatlands nature reserve. Correspondingly, this study also investigates the effect of electric voltage ranging from 5 V to 30 V and treatment time between 5 min and 30 min on the reduction of humic substances in peat water by utilising electrocoagulation treatment. Subsequent, this study has found that the batch electrocoagulation treatment system could effectively reduce 97.12% of colour, 95.56% of turbidity, 88.46% of total suspended solids (TSS), 90.00% of total dissolved solids (TDS), and 97.30% of chemical oxygen demand (COD) from peat water at 30 V of electric voltage and 25 min of treatment time. These operating conditions could generate an adequate production of aluminium hydroxide coagulants in order to remove humic substances from tropical peat water in the form of flocs. The study has noticed that the treated peat water could be utilised as a clean water source owing to the levels of 13 TCU of colour, 2 NTU of turbidity, 3 mg/L of total suspended solids, 2 mg/L of total dissolved solids, and 4 mg/L of chemical oxygen demand have met the Malaysia Class I standard in National Water Quality Standards (NWQS). From the total operating cost analysis conducted, the treatment of peat water by using batch electrocoagulation system cost only United States Dollars (USD) 0.65 per metre cubic. Overall, this study deduces that a batch electrocoagulation treatment system could be utilized to treat tropical peat water sources in Sarawak peatlands nature reserve.

1. Introduction

Peatlands areas feature a natural accumulation of peat deposits layers which consists of 30% of dead organic materials [17]. According to Omar et al. [37], tropical peatlands on Borneo Island are mainly distributed in Brunei Darussalam, Sarawak, and Indonesia. These regions are also constituted of dead halophytic plant remnants that are

accumulated with peat water [37]. An earlier study conducted by Xu et al. [60] reported that about 28% of the water supply in peatlands is protected owing to the peat water being considered a sustainable water resource provision. As reported by Cole et al. [16], about 28% of Sarawak peatlands areas are dedicated to agriculture activities whereas 67.6% of these regions are classified as reserved forests and resettlements.

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