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Electrode Design for Electrochemical Cell to Treat Palm Oil Mill Effluent by Electrocoagulation Process

Mohd Nasrullah¹, Lakhveer Singh², Santhana Krishnan¹, Mimi Sakinah¹, A.W. Zularisam^{1*}

¹ Faculty of Engineering Technology, Universiti Malaysia Pahang (UMP), Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia.

² Department of Biological and Ecological Engineering, Oregon State University, Corvallis, OR 97333, USA.

*Corresponding author. E-mail address: zularisam@ump.edu.my, zularisam@gmail.com

Abstract

In the present study, the removal of chemical oxygen demand (COD), biochemical oxygen demand (BOD) and suspended solid (SS) from Palm Oil Mill Effluent (POME) by electrocoagulation process was investigated by operating the electrochemical cell using various types of electrode design. The experiments were carried out by designing the electrode in vertical and horizontal orientation; monopolar series (MP-S), monopolar parallel (MP-P) and bipolar (BP) arrangement; and by applying aluminium, iron and steel wool as electrode material. The highest removal efficiency of 74, 70 and 66% for COD, BOD and SS respectively were obtained by selecting vertical orientation, MP-S arrangement and steel wool material. However, the economic study shows that MP-S arrangement has higher operating cost than MP-P and BP. While, the placement of electrode in vertical orientation not only gaining a higher removal efficiency, but also economical. A novel steel wool that was used in the study has given the great performance by removing the pollutants fast, effective and with reasonable price. This research originally attempts to highlight the significance of electrode design including orientation, arrangement and material, and the effect of the best design combination.

Keywords: Electrode design; Electrocoagulation; POME; COD; BOD; SS

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