

Development of Electrochemical Method to Remove Nitrogenous Compounds from Prawn Industry Wastewater

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The prawn-farm industry is one of the fastest growing export-oriented industries in Sri Lanka. Wastewater originating from prawn-farms contains an excessive amount of nutrients that becomes a serious environmental issue. Currently, there is no proper wastewater treatment method to remove nitrogenous compounds in Sri Lanka. Thus, the study aimed to develop an electrochemical method to remove nitrogenous compounds from simulated prawn-farm wastewater. Further, this method investigated the effect of control factors such as pH, retention time, current, and surface area of the electrodes using Taguchi method which identifies proper control factors to obtain the optimum results in the removal of nitrogenous compounds by using carbon and aluminum electrodes with KCl salt bridge. Results indicate that with carbon electrodes the maximum (50%) removal efficiency was obtained in 16 hours constant retention time and changing pH, DC, and surface area, respectively, about 4, 350 mA at 22.4 V, and 10 cm². Our results are comparable to the results obtained with Taguchi method where the optimum level was obtained under following conditions where pH = 4, DC = 450 mA at 22.4 V, retention time = 16 hours, and surface area = 40 cm². In aluminum electrodes the maximum (54%) removal efficiency was obtained by changing retention time, pH, DC, and surface area with controlling parameters of 4 hours, 2, 450 mA at 22.4 V, and 10 cm², respectively. Results are comparable to results obtained with Taguchi method where optimum level have obtained under following conditions where pH = 2, DC = 250 mA at 6.8 V, retention time = 4 hours, and surface area = 40 cm². Therefore, the results concluded that aluminum electrodes are better than carbon electrodes to remove nitrogenous compounds even though carbon electrodes can be used due to its low cost, simplicity, and easily renewable surface. The electrochemical method could be a potential method to remove nitrogenous compounds due to its high efficiency, low cost and ease in handling.

Keywords: Electrochemical method, Nitrogenous compounds, Prawn industry's wastewater, Taguchi method.