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Combination of electrolysis and microalgae cultivation for beneficial reuse of fertilizer wastewater from poultry manure anaerobic digestion effluent

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ABSTRACT

Poultry manure anaerobic digestion effluent (PMADE) contained a high content of ammonia nitrogen (NH_4^+–N), which should be treated properly before discharge. However, the mechanism of electrolysis in treating high NH_4^+–N (over 1,500 mg L^{-1}) wastewater has never been studied. In this study, fertilizer wastewater from PMADE with high content of NH_4^+–N (over 3,000 mg L^{-1}) and low carbon/nitrogen (C/N) ratio was treated via electrolysis and microalgae. Results showed the highest removal of NH_4^+–N, total organic carbon (TOC) and inorganic carbon (IC) in electrolysis were 47%, 76%, and 93%, respectively. Quadratic functions are suitable to simulate NH_4^+–N removal of FW (coefficient is over 0.95). The removal efficiency of NH_4^+–N was 10%–65% during microalgae cultivation. The removal of NH_4^+–N, total phosphorus (TP), IC, and TOC in fertilizer wastewater by the combination of electrolysis and microalgae cultivation achieved 96%, 63%, 95%, and 52%, respectively. *Chlorella* sp. used 3.11% carbon, 15.0% nitrogen, and 13.5% phosphorus in the FW as substrates. This study provided an alternative approach to treat and reuse high-ammonia containing wastewater.

Keywords: Electrochemical oxidation; Fertilizer wastewater; Microalgae; Ammonia nitrogen

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