



“Gheorghe Asachi” Technical University of Iasi, Romania



INSIGHTS INTO LIQUID DIGESTATE TREATMENT THROUGH BATCH ELECTROCOAGULATION-FLOCCULATION SYSTEM

Ana-Maria Galan¹, Constantin Neamtu¹, Grigore Psenovschi^{1,2}, Ionut Banu²,
Anca Paulenco¹, Sanda Velea¹, Alexandru Vlaicu^{1*}

¹The National Institute for Research & Development in Chemistry and Petrochemistry ICECHIM, 202 Spl. Independentei, Bucharest, 060021, Romania

²University Politehnica of Bucharest, Faculty of Applied Chemistry and Materials Science, 1-7 Gheorghe Polizu Street, Bucharest, 011061, Romania

Abstract

This study aims to evaluate the performance of the electrocoagulation-flocculation (ECF) process for treating liquid digestate generated via anaerobic digestion (AD). For this purpose, ECF in batch system was studied as a treatment for turbidity reduction and total nitrogen (TN), total phosphorus (TP) and total organic carbon (TOC) decrease by using as process factors electrode distance and applied voltage onto the electrodes, as well as the ECF time. The Response Surface Method approach through a 2³ full-factorial experimental design showed a non-linear influence of the factors on the dependent variables considered in this study. The maximum turbidity reduction (about 92%) was obtained at an ECF time of 90 min, 12V applied voltage and 2 cm electrode distance (reduction of 35.5% TN, 50.7% TP, 67.8% TOC). For lower energy consumption, for example at 9V, 3 cm between electrodes and 60 min reaction time, turbidity reduction and TP significantly decreased to 57% and 38.1% respectively, while the reduction rates for the other monitored parameters, 31.9% TN and 65.2% TOC, were only slightly lower than those obtained in the more energy demanding ECF process which yielded the highest turbidity reduction. When considering the application of ECF at a larger scale, a more promising option would be lower applied voltage and shorter reaction times, combined with other contaminant removal technologies, such as microalgae cultivation for nutrient reclamation.

Key words: anaerobic digestion, electrocoagulation-flocculation, liquid digestate, wastewater

Received: February, 2023; Revised final: April, 2024; Accepted: April, 2024; Published in final edited form: August, 2024

* Author to whom all correspondence should be addressed: e-mail: alexvlaicu16@yahoo.co.uk; Phone: +40 728160491; Fax: +40 213123493