

LIST OF FIGURES

- Figure 1: Anaerobic digestion process **Error! Bookmark not defined.**
- Figure 2: Substrate for anaerobic co-digestion process **Error! Bookmark not defined.**
- Figure 3: Types of anaerobic reactors **Error! Bookmark not defined.**
- Figure 4: OFMSW for lab-scale experiment **Error! Bookmark not defined.**
- Figure 5: Pretreatment of OFMSW and substrate preparation **Error! Bookmark not defined.**
- Figure 6: Fabrication of lab-scale anaerobic reactor **Error! Bookmark not defined.**
- Figure 7: Schematic diagram and the lab-scale experimental setup **Error! Bookmark not defined.**
- Figure 8: Calibration plot of phosphate **Error! Bookmark not defined.**
- Figure 9: Feed Forward Neural Network (FFNN) flow diagram to develop a prediction model **Error! Bookmark not defined.**
- Figure 10: Process flow diagram for development of ANFIS model **Error! Bookmark not defined.**
- Figure 11: Effect on Total Solids (gm/L) during anaerobic co-digestion process **Error! Bookmark not defined.**
- Figure 12: Effect on pH during anaerobic co-digestion process **Error! Bookmark not defined.**
- Figure 13: % VS reduction, % COD reduction, Specific Biogas yield (L/kg VS added) for batch anaerobic co-digestion at different mixing ratios **Error! Bookmark not defined.**
- Figure 14: VBPR (Volumetric Biogas Production Rate) (L/L/d); SBGY (Specific Bio-Gas Yield) (L/kg VS added); Cumulative Biogas Yield (L/kg VS added) for different mixing ratios (A) 50:50 (B) 75:25 (C) 90:10 (D) 0:100 (only sludge) (E) 100:0 (only OFMSW) of anaerobic co-digestion **Error! Bookmark not defined.**
- Figure 15: Presence of methane gas during the methanogenesis phase **Error! Bookmark not defined.**
- Figure 16: (A) Methane yield (L/d) (B) Cumulative methane yield (L) for batch anaerobic co-digestion with different mixing ratio **Error! Bookmark not defined.**
- Figure 17: Microscopic analysis (A) Methanogens in the whole sample (B) Methanogens in the supernatant (C) SEM image of methanogens during the methanogenesis phase **Error! Bookmark not defined.**
- Figure 18: Plot of methane yield using kinetic modelling for different mixing ratios (A) 50:50, (B) 75:25, (C) 90:10, (D) 0:100, (E) 100:0 **Error! Bookmark not defined.**

Figure 19: % VS removal efficiency at different OLR **Error! Bookmark not defined.**

Figure 20: pH of the reactor for a semi-continuous flow reactor **Error! Bookmark not defined.**

Figure 21: VFA/Alkalinity ratio for different OLR **Error! Bookmark not defined.**

Figure 22: Biogas yield for semi-continuous flow anaerobic reactor with varied OLR.. **Error! Bookmark not defined.**

Figure 23: Kinetic modelling for cumulative biogas yield for semi-continuous flow anaerobic reactor **Error! Bookmark not defined.**

Figure 24: A modified hybrid kinetic model for cumulative biogas yield **Error! Bookmark not defined.**

Figure 25: Plot for evaluation of kinetic model (A) The Modified Stover- Kincannon model (B) Grau's Second-Order kinetic model (C) First-Order kinetic model **Error! Bookmark not defined.**

Figure 26: Modified Stover- Kincannon Model for Volatile Solids output **Error! Bookmark not defined.**

Figure 27: Experimental and Prediction Volatile solids output (gm/L) **Error! Bookmark not defined.**

Figure 28: Grau's Second-order kinetic model for Volatile Solids output **Error! Bookmark not defined.**

Figure 29: Experimental and predicted Volatile Solids output with Garu's second order model **Error! Bookmark not defined.**

Figure 30: Architecture of Artificial Neural Network **Error! Bookmark not defined.**

Figure 31: ANN performance model with training function Bayesian Regularization ... **Error! Bookmark not defined.**

Figure 32: Correlation between experimental and predicted methane yield (L/kgVS_{removed}) **Error! Bookmark not defined.**

Figure 33: Correlation between experimental and predicted % VS_{removed} **Error! Bookmark not defined.**

Figure 34: (A) ANN-PSO model for different numbers of Swarm size, (B) ANN-PSO model performance for different numbers of Neurons **Error! Bookmark not defined.**

Figure 35: ANN-PSO (A) regression (B) convergence **Error! Bookmark not defined.**

Figure 36: Experimental and predicted methane yield using ANN-PSO **Error! Bookmark not defined.**

Figure 37: Co-relation between experimental and predicted ANFIS model data using different membership functions for methane yield using (A)trimf (B)trapmf (C) gaussmf (D)gbell (E)gauss2mf..... **Error! Bookmark not defined.**

Figure 38: Abundance of bacterial community at (A) Phylum level (B) Class level (C) Family level (D) Genus level **Error! Bookmark not defined.**