PROCESS SIMULATION OF ANAEROBIC DIGESTION FOR BIOLIQUID PRODUCTION FROM FOOD WASTE

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Extended Abstract

Anaerobic digestion is one of the most widespread technologies to treat organic waste. It uses enzymes to solubilize particulate organic compounds so that they can be easily separated from non-biodegradable waste such as plastic, metals and textiles. There are four steps in the anaerobic digestion process: hydrolysis, acidogenesis, acetogenesis and methanogenesis. The complex substrates such as proteins, carbohydrates and fats are hydrolyzed into their respective monomers, such as amino acids, glucose and fatty acids. The hydrolyzed monomers then are converted into different volatile fatty acids (VFA), later the VFA are converted into carbon dioxide, acetic acid, and hydrogen. Food waste is the main composition of municipal solid waste which comprises 49% of total waste [1]. Food waste is a typical form of organic matter with a high potential for energy production through anaerobic degradation [2]. This study aims to model the anaerobic digestion process to transform the food waste into bioliquid. A simulation of the anaerobic digestion process has been carried out using RSTOIC and RCSTR reactors in Aspen Plus. The hydrolysis reactions occur in RSTOIC reactor meanwhile amino acid degradation, acidogenic and acetogenic reactions are implemented in RCSTR reactor. The biochemical reactions and reaction rate equations of anaerobic digestion model No. 1 (ADM1) developed by the international water association (IWA) were employed in this work. The simulation results were validated with experimental data [3]. The amount of dry matter content in bioliquid was 20wt% which mainly consists of VFA. The high amount of VFA is important to extent the process for biogas production. Sensitivity analysis has been performed in order to study the effect of residence time for the production of organic liquid fraction (bioliquid). The amount of bioliquid produced was increased as residence time was increased as depicted in Figure 1. The longer residence time will allow the enzymatic process to be more efficient where the bonds of the organic materials will be broken and hydrolysis will occur [4].

Keywords: anaerobic digestion; food waste; municipal solid waste; bioliquid; process simulation.

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References

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