芦笋秸秆预处理与厌氧发酵制取沼气试验 Experiments on Pretreatment and Anaerobic Digestion of Asparagus Stalk for Biogas Production

孙辰 刘荣厚 覃国栋

上海交通大学

关键词： 芦笋 秸秆 厌氧发酵 沼气 木质纤维素 碱处理

摘 要： 为了促进芦笋秸秆原料沼气发酵系统的产气效果，利用NaOH在无流动水的条件下对芦笋秸秆进行了碱性化学预处理，并在小型沼气发酵装置上以不同预处理时间、粒径和NaOH溶液质量分数对芦笋秸秆木质纤维素的变化及产沼效果的影响进行了试验研究。结果表明，预处理时间15~20 d比不经预处理的试验组启动时间提早10 d；芦笋秸秆粉碎和切割后，不经筛分的试验组比经过筛分后的试验组启动时间提早5~15 d，发酵周期缩短23 d；5% NaOH处理的试验组比NaOH 10%处理和不使用NaOH处理的试验组总产气量分别高453.82%和84.58%。综合比较，预处理时间15~20 d、不经筛分和5% NaOH处理的条件下是较优的工艺条件，沼气发酵后其甲烷体积分数最高达70%，pH值大于7.5，均在正常范围内。 NaOH pretreatment of asparagus stalk without fluid water and its anaerobic digestion after pretreatment were performed in order to improve biogas production. Effects of pretreatment time, particle size and NaOH concentration on contents of cellulose, hemicellulose and lignin and yield of biogas were investigated in a bench scale anaerobic digester. Results showed that start-up time of test group with pretreatment time of 15~20 d was 10 d earlier than that of test group without pretreatment. After the asparagus stalk was crumbled and cut, the start-up time of test group without screening was 5~15 d earlier than that of groups with different particle size after screening. At the same time, the fermentation time was shortened by 23 d. Total biogas yield of test groups using 5% NaOH in pretreatment were 453.82% and 84.58% higher than groups with 10% and 0% NaOH in pretreatment, respectively. After integrated analysis of experimental results, the suitable NaOH pretreatment conditions were determined as follows: NaOH pretreatment of 15~20 d, no screening after crumbling and cutting and with NaOH concentration of 5%. Under this kind of pretreatment conditions, methane content of biogas during anaerobic digestion was above 70%, while pH value was above 7.5, which were located in normal range.

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