

牛粪、鸡粪和稻秆混合的沼气发酵特性与工艺优化 Fermentation and Process Optimization of Mixed Cow Dung, Chicken Manure and Rice Straw for Biogas Production

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关键词: 沼气发酵 牛粪 鸡粪 稻秆 温度 配比

摘要: 采用可控恒温厌氧发酵装置, 选用牛粪、鸡粪、稻秆3种原料, 按干物质比例0:2:1、0.4:1.6:1、0.8:1.2:1、1.2:0.8:1、1.6:0.4:1、2:0:1混合, 研究了各配比在15℃、20℃、25℃、30℃下的厌氧发酵情况。结果表明: 随温度升高, 各配比产气速率和累积产气量均增大, 15℃下发酵周期最长, 其他温度对发酵周期影响无显著差异; 不同配比下, 累积产气量均呈先增大后减小的趋势, 牛粪、鸡粪、稻秆3种原料混合的发酵效果显著好于牛粪与稻秆、鸡粪与稻秆2种原料混合的发酵效果, 但对比对发酵周期无显著影响。通过模型预测, 得到最优工艺组合, 在发酵温度为30℃, 牛粪、鸡粪与稻秆配比为1.22:0.78:1时, 可获得最大累积产气量为28308.7mL。 Fermentation of raw materials can be mixed to make up for deficiencies of the single fermentation and in different degrees to enhance the effect of fermentation of raw materials. This research was carried out in controllable constant-temperature fermentation equipment. Cow dung, chicken manure and rice straw were selected with the proportions of TS ratio(0:2:1, 0.4:1.6:1, 0.8:1.2:1, 1.2:0.8:1, 1.6:0.4:1, 2:0:1) as raw materials, and biogas fermentation at temperatures of 15℃, 20℃, 25℃ and 30℃ was studied. The main conclusions were drawn as follows: the biogas production rate and cumulative biogas yield of each proportion rose with the increase of temperature; the fermentation period was longest at 15℃, but there were no difference among the other temperatures; the cumulative biogas yield was first increased and then decreased with the change of proportion, that was fermentation of a mixture of three types of raw materials—cow dung, chicken manure and rice straw, was significantly better than the effect of the mixture of cow dung and rice straw, as well as the mixture of chicken manure and rice straw, but no significant impact on the fermentation period. The model predicted, with the optimal combination of technology, the temperature of 30℃ and the TS ratio of cow dung, chicken manure and rice straw was respectively 1.22:0.78:1, the cumulative biogas yield was expected to reach maximum 28308.7 mL.

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