

PENGARUH KOMBINASI KARBON AKTIF TONGKOL JAGUNG DAN ZEOLIT AKTIF DALAM MENGADSORPSI KARBON DIOKSIDA (CO₂) TERHADAP NILAI KALOR BIOGAS

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INTISARI

Biogas merupakan gas yang dihasilkan dari proses fermentasi bahan organik oleh bakteri anaerob yang bersifat mudah terbakar. Penelitian ini bertujuan untuk mengetahui pengaruh kombinasi karbon aktif tongkol jagung dan zeolit aktif dalam meningkatkan kualitas biogas. Parameter yang diamati dalam penelitian ini yaitu kandungan gas CO₂, CH₄, nilai kalor pemanasan air, nilai kalor teoritis biogas dan efisiensi pembakaran biogas. Penelitian ini dilakukan di Fakultas Peternakan Universitas Gadjah Mada dan Pusat Inovasi Agroteknologi (PIAT). Perlakuan dibagi atas 5 kombinasi adsorben karbon aktif tongkol jagung dan zeolit aktif yaitu perlakuan pertama 0% karbon aktif tongkol jagung dan 100% zeolit aktif (P1); perlakuan kedua 25% karbon aktif tongkol jagung dan 75% zeolit aktif (P2); perlakuan ketiga 50% karbon aktif tongkol jagung dan 50% zeolit aktif (P3); perlakuan keempat 75% karbon aktif tongkol jagung dan 25% zeolit aktif (P4) dan perlakuan lima 100% karbon aktif tongkol jagung dan 0% zeolit aktif (P5) dengan pengulangan sebanyak tiga kali. Parameter pengujian meliputi uji Gas Chromatography (GC), uji nilai kalor pemanasan air, uji nilai kalor teoritis biogas dan efisiensi pembakaran. Analisis yang digunakan yaitu variansi pola searah dan dilanjutkan dengan uji DMRT apabila berbeda nyata. Hasil penelitian diperoleh bahwa penurunan kadar CO₂, nilai kalor pemanasan air, dan nilai kalor teoritis tertinggi pada perlakuan P4 dengan nilai masing-masing sebesar $33,02 \pm 7,63\%$; $254.1327 \pm 4,19$ kJ, dan $1957.00 \pm 14,18$ kJ sedangkan untuk peningkatan kadar CH₄ tertinggi pada perlakuan P5 sebesar $6.27 \pm 2,41\%$ dan untuk efisiensi pembakaran tertinggi pada perlakuan P2 sebesar $13.47 \pm 0,34\%$. Untuk mendapatkan penurunan kadar CO₂, nilai kalor pemanasan air dan nilai kalor teoritis biogas tertinggi maka dapat dilakukan dengan perlakuan P4.

Kata kunci : biogas, karbon dioksida, karbon aktif, tongkol jagung, zeolit

EFFECT OF COMBINATION OF ACTIVATED CORN COB AND ZEOLIT ACTIVE CARBON IN ADSORTING CARBON DIOXIDE (CO₂) TO BIOGAS VALUE

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ABSTRACT

Biogas is a gas produced from the fermentation process of organic matter by anaerobic bacteria which is flammable. This study aims to determine the effect of the combination of activated carbon corn cobs and activated zeolite in improving the quality of biogas. The parameters observed in this study were the gas content of CO₂, CH₄, heating value of water, theoretical calorific value of biogas and biogas combustion efficiency. This research was conducted at the Faculty of Animal Husbandry, Gadjah Mada University and the Pusat Inovasi Agroteknologi (PIAT). The treatments were divided into 5 combinations of activated carbon corn cobs and activated zeolite, namely the first treatment 0% activated carbon corn cobs and 100% activated zeolite (P1); second treatment 25% activated carbon corn cobs and 75% activated zeolite (P2); third treatment 50% activated carbon corn cobs and 50% activated zeolite (P3); fourth treatment 75% activated carbon corn cobs and 25% activated zeolite (P4) and treatment five 100% activated carbon corn cobs and 0% activated zeolite (P5) with three repetitions. The test parameters include the Gas Chromatography (GC) test, the heating value of water, the theoretical calorific value test for biogas and combustion efficiency. The analysis used was the unidirectional pattern variance and continued with the DMRT test if it was significantly different. The results showed that the reduction in CO₂ levels, heating value of water, and the highest theoretical heating value in treatment P4 with each value of 33.02 ± 7.63%; 254.1327 ± 4.19 kJ, and 1957.00 ± 14.18 kJ, while for the highest increase in CH₄ levels in treatment P5 was 6.27 ± 2.41% and for the highest combustion efficiency in treatment P2 was 13.47 ± 0.34%. To get a decrease in CO₂ levels, the heating value of water and the highest theoretical calorific value of biogas, it can be done with P4 treatment.

Key Words : Biogas, carbon dioxide, activated carbon, corn cob, zeolite