

## PENGARUH KOMBINASI KARBON AKTIF CANGKANG TELUR AYAM DAN ZEOLIT AKTIF SEBAGAI ADSORBEN DALAM MENGADSORBSI CO<sub>2</sub> TERHADAP KUALITAS BIOGAS

Nelly Wira Nurhadi  
16/394481/PT/07154

### INTISARI

Penelitian ini bertujuan untuk mengetahui efektivitas kombinasi karbon aktif cangkang telur ayam dan zeolit aktif dalam mengurangi karbon dioksida, meningkatkan nilai kalor serta efisiensi biogas dan warna nyala api biru sehingga kualitas biogas meningkat setelah proses adsorpsi. Penelitian ini menggunakan biogas yang diproduksi di Pusat Inovasi Agroteknologi (PIAT) dengan menggunakan 5 macam adsorben sebagai perlakuan. Masing-masing perlakuan mempunyai ulangan sebanyak tiga kali. Analisis data menggunakan analisis variasi dengan rancangan *oneway ANOVA*, variable yang berbeda karena perlakuan diuji lanjut dengan *Duncan's Multiple Range Test (DMRT)*. Penelitian ini dibagi atas 5 perlakuan yaitu, karbon aktif cangkang telur ayam 0% dan zeolit aktif 100% (P1), karbon aktif cangkang telur ayam 25% dan zeolit aktif 75% (P2), karbon aktif cangkang telur ayam 50% dan zeolit aktif 50% (P3), karbon aktif cangkang telur ayam 75% dan zeolit aktif 25% (P4), karbon aktif cangkang telur ayam 100% (P5). Hasil penelitian menunjukkan bahwa penurunan CO<sub>2</sub> pada P1, P2, P3, P4, P5 secara berturut-turut adalah 1,25%, 4,93%, 16,91%, 4,72%, dan 13,07%. Penurunan CO<sub>2</sub> tertinggi adalah P4 sebesar 4,72%. Persentase peningkatan CH<sub>4</sub> pada P1, P2, P3, P4, P5 secara berturut-turut adalah 4,97%, 8,49%, 21,30%, 1,54%, dan 18,07%. Peningkatan CH<sub>4</sub> tertinggi adalah P3 sebesar 21,30%. Nilai kalor pemanasan air pada kontrol, P1, P2, P3, P4, P5 secara berturut-turut adalah 206,66±11,15kJ, 235,98±2,41kJ, 234,71±4,00kJ, 242,96±4,18kJ, 248,55±2,41, dan 223,41±2,41. Perlakuan P4 menunjukkan perbedaan yang nyata dibandingkan perlakuan larutan P1, P2, P5, akan tetapi tidak menunjukkan perbedaan nyata dibandingkan perlakuan P3 ( $P < 0,05$ ). Nilai kalor perhitungan pada kontrol, P1, P2, P3, P4, P5 secara berturut-turut adalah 2041±89,23kJ, 1848,7±34,94kJ, 1907,3±3,95kJ, 1875,9±0,89, 2067,6±95,95kJ, 1795,4±1,89. Penelitian ini dapat disimpulkan bahwa perlakuan karbon aktif cangkang telur ayam 75% dan zeolit aktif 25% (P4) merupakan perlakuan terbaik dengan hasil penurunan CO<sub>2</sub> tertinggi diikuti dengan nilai kalor pemanasan air dan nilai kalor perhitungan.

Kata kunci: Adsorpsi, karbon aktif cangkang telur ayam, zeolit aktif, CO<sub>2</sub>, CH<sub>4</sub>, nilai kalor.

## EFFECT COMBINATION OF ACTIVATED CARBON OF CHICKEN EGG SHELL AND ACTIVATED ZEOLITE AS AN ADSORBENT TO ADSORBS OF CARBON DIOXIDE IN BIOGAS QUALITY

Nelly Wira Nurhadi  
16/394481/PT/07154

### ABSTRACT

The aim of the study was to know the effectivity combination between activated carbon of chicken eggshell and activated zeolite to reduce carbon dioxide, increase calorific value, biogas efficiency, and blue fame, so the quality of biogas will increase after absorption process. This research used biogas produced in Pusat Inovasi Agroteknologi (PIAT) by using 5 adsorbents with three times replications. Data analysis used oneway ANOVA, then different variable because of treatments, and further tested with *Duncan's Multiple Range Test* (DMRT). This research was divided into 5 treatments, that were activated zeolite 100% (P1), activated carbon of chicken eggshell 25% and activated zeolite 75% (P2), activated carbon of chicken eggshell 50% and activated zeolite 50% (P3), activated carbon of chicken eggshell 75% and activated zeolite 25% (P4), activated carbon of chicken eggshell 100% (P5). The result of this research was the percentage of reduction of CO<sub>2</sub> to P1, P2, P3, P4, P5 in sequence were 1,25%, 4,93%, 16,91%, 4,72%, dan 13,07%. The highest reduction was P4 4,72%. The percentage of increase of CH<sub>4</sub> to P1, P2, P3, P4, P5 in sequence were 4,97%, 8,49%, 21,30%, 1,54%, dan 18,07%. The highest increase was P5. The heating value of water to control, P1, P2, P3, P4, P5 in sequence were 206,66±11,15kJ, 235,98±2,41kJ, 234,71±4,00kJ, 242,96±4,18kJ, 248,55±2,41, dan 223,41±2,41. The treatment of P4 showed significant difference compared to P1, P2, P5, but it didn't show significant difference compared to P3 (P<0,05). The result of research to the heating value to control, P1, P2, P3, P4, P5 in sequence were 2041±89,23kJ, 1848,7±34,94kJ, 1907,3±3,95kJ, 1875,9±0,89, 2067,6±95,95kJ, 1795,4±1,89. Based on the research, it was concluded that the treatments of activated carbon of chicken eggshell 75% and activated zeolite 25% (P4) was the best treatment by the result of the highest CO<sub>2</sub> reduction and followed by heating value of water and heating value of calculation.

Keywords: adsorption, activated carbon of chicken eggshell, activated zeolite, CO<sub>2</sub>, CH<sub>4</sub>, calorific value.