

Proses simultan absorpsi adsorpsi dalam purifikasi biogas berbasis limbah cair kelapa sawit = Simultaneous process of absorption adsorption in purification of biogas from palm oil mill effluent

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Abstrak

[Produksi biogas menggunakan limbah cair kelapa sawit (LCKS) dengan proses digesting anaerob menggunakan tangki digester menghasilkan CH₄ sebesar ±87% dan gas CO₂ sebesar ±13%. Metode absorpsi dan kolom adsorpsi adalah beberapa proses sederhana yang mudah untuk diaplikasikan, aplikasinya dapat menggunakan zeolit alam sebagai adsorben dan larutan Ca(OH)₂ sebagai adsorben. Kedua metode tersebut dapat digunakan secara simultan untuk proses purifikasi biogas dengan cara biogas dialirkan terlebih dahulu ke dalam larutan Ca(OH)₂ dan kemudian akan dilewatkan ke dalam kolom dengan ukuran tinggi dan diameter dalam sebesar 15cm dan 0,8cm yang berisi zeolit alam termodifikasi. Untuk meningkatkan daya adsorpsi dapat dilakukan modifikasi permukaan zeolit alam dengan perlakuan asam kuat-basa kuat dengan variasi konsentrasi 1, 2, dan 3M, kalsinasi pada suhu 450°C, dan melapisi permukaan zeolit alam dengan beberapa variasi konsentrasi kitosan yaitu 0,25; 0,5; dan 1%. Penggunaan asam kuat-basa kuat dapat meningkatkan luas permukaan dan diameter, sedangkan pelapisan kitosan dapat meningkatkan kapasitas adsorpsi pada zeolit alam karena adanya gugus amine pada kitosan. Hasil modifikasi dan aktivasi zeolit akan diuji menggunakan SEM-EDX, BET, FTIR, dan XRD, sedangkan hasil purifikasi biogas akan diuji menggunakan gas chromatography (GC). Adsorben terbaik yang didapatkan dari penelitian ini adalah adsorben dengan perlakuan asam-basa 2M yang kemudian dilapisi kitosan 0,5%. Hasil purifikasi yang didapatkan adalah pengurangan kadar CO₂ pada biogas menjadi 0.42% dan peningkatan kadar CH₄ menjadi 99.58%.; Production of biogas from POME by anaerobic digestion process using digester has been shown able to produce CH₄ 87 and CO₂ 13 The methods of absorption and adsorption is simple to be applied this method can be done with zeolite as adsorbent and Ca OH 2 as adsorbent Both methods can be applied simultaneous for purification which the gas will pass through the chamber Ca OH 2 solution and then passed the column filled with modified natural zeolite Enhancing the adsorption capability done with modified the zeolite using some concentration in strong acid base 1 2 and 3M calcination at 450 C and coating with chitosan 0 25 0 5 and 1 Usage of strong acid and strong base can increase the surface area and diameter of the zeolite pores while coating with chitosan can increase the adsorption capacity because the amine functional group from chitosan The result of the modification of zeolite will be tested with SEM EDX BET FTIR and XRD while the result of the purification will be characterized with GC The best adsorbent from this research is zeolite modified with acid base 2M and coated with 0 5 of chitosan The final result from this research is CO₂ about 0 42 and the CH₄ become 99 58 , Production of biogas from POME by anaerobic digestion process using digester has been shown able to produce CH₄ 87 and CO₂ 13 The methods of absorption and adsorption is simple to be applied this method can be done with zeolite as adsorbent and Ca OH 2 as adsorbent Both methods can be

applied simultaneously for purification which the gas will pass through the chamber Ca(OH)₂ solution and then passed the column filled with modified natural zeolite. Enhancing the adsorption capability done with modified the zeolite using some concentration in strong acid base 1, 2 and 3M calcination at 450 C and coating with chitosan 0.25, 0.5 and 1. Usage of strong acid and strong base can increase the surface area and diameter of the zeolite pores while coating with chitosan can increase the adsorption capacity because the amine functional group from chitosan. The result of the modification of zeolite will be tested with SEM, EDX, BET, FTIR and XRD while the result of the purification will be characterized with GC. The best adsorbent from this research is zeolite modified with acid base 2M and coated with 0.5 of chitosan. The final result from this research is CO₂ about 0.42 and the CH₄ become 99.58 %]