Pengaruh Karbon Aktif Sebagai Adsorben Pada Distilasi - Adsorpsi Campuran Etanol - Air = The Influence of Activated Carbon as Adsorbent in Adsorptive - Distillation of Ethanol - Water Mixture

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Abstrak

Peningkatan kebutuhan bahan bakar fosil masyarakat saat ini yang tidak diimbangi dengan persediannya merupakan masalah serius, sehingga diperlukan sumber energi alternatif bersih dan ramah lingkungan salah satunya etanol. Pada penggunaannya, etanol memiliki kendala yakni sulit untuk mencapai standar ASTM D4806 kadar air dalam campuran etanol maksimum 1.0% v/v dikarenakan titik azeotrop pada campuran etanol – air. Oleh karena itu, diperlukan metode pemurnian etanol terbaik. Salah satu metode ekonomis dan efektif untuk memurnikan etanol adalah distilasi – adsorpsi proses pemurnian dengan distilasi dan adsorpsi secara simultan. Pada penelitian ini, membahas pemurnian etanol – air melalui proses distilasi – adsorpsi menggunakan dua jenis karbon aktif (Calgon dan Haycarb) dengan variasi berat sebesar 25 gram dan 50 gram, konsentrasi masukan awal etanol sebesar 90% v/v dan 95% v/v, suhu dijaga konstan pada titik didihnya pada tekanan 1 atm, data pengamatan diambil setiap interval waktu 5 – 10 menit, dan diuji menggunakan densitometer: DMA 4100. Hasil penelitian menunjukkan bahwa metode distilasi – adsorpsi dengan karbon aktif dapat melampaui titik azeotropnya dan memenuhi syarat Fuel Grade Ethanol. Konsentrasi etanol tertinggi saat menggunakan 50 gram karbon aktif calgon dengan etanol awal 95% v/v yakni 99,49% v/v tercapai pada waktu 15 menit. Sedangkan, 25 gram karbon aktif haycarb dengan etanol awal 90% v/v menghasilkan konsentrasi etanol terendah dari variasi penelitian lainnya sebesar 98,27% v/v. .....Bioethanol is one of the clean and ecologically friendly alternative energy sources that is required due to the current surge in human demand for fossil fuels that is not being met by their supply. Because of the ethanol-water mixture's azeotropic point, it is challenging to employ bioethanol according to the ASTM D4806 standard, which calls for a maximum water content of 1.0% v/v in the ethanol mixture. Consequently, the best ethanol purification method is required. Distillation-adsorption is one of the more affordable and efficient ways to purify ethanol because it simultaneously uses distillation and adsorption to carry out the purification process. The initial input concentration of ethanol in this study was 90% v/v and 95% v/v, and it was purified using a distillation-adsorption process using two types of activated carbon (Calgon and Haycarb) with weight variations of 25 grams and 50 grams. The temperature was maintained at the boiling point at a pressure of 1 atm, and the observational data was collected every 5 to 10 minutes and tested using a densitometer: DMA 4100. According to the result, the distillation-adsorption technique using activated carbon exceeded its azeotropic point and produced fuel grade ethanol that satisfied all requirements. The highest ethanol concentration, 99.49% v/v, was achieved in 15 minutes utilizing 50 grams of cagon activated carbon and beginning ethanol that was 95% v/v. Meanwhile, the lowest ethanol concentration of the other research variants was achieved with 25 grams of haycarb activated carbon and 90% v/v starting ethanol, at 98.27% v/v.