EFFECT OF TEMPERATURE AND BLENDING RATIO TO PRODUCT DISTRIBUTION OF CO-PYROLYSIS LIGNITE AND PALM KERNEL SHELL

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Abstract

The issue of the energy crisis and environmental problems due to waste encourage the formation of new fuels from renewable materials such as palm kernel shell biomass (CKS). In other hand, low rank coal (lignite) has low economic value, so it needs to be improved to be used widely. Utilization of lignite and CKS can produce solid products (char) in the form of hybrid coal through the co-pyrolysis process. This study aims to determine the optimum temperature and composition of co-pyrolysis lignite and CKS based on the distribution of the resulting product. The lignite is dried and pulverized to a particle size of 20-50 mesh. CKS cleaned, cut into pieces and sieved to a size of 0.4-2 mm. Then the CKS was dried in an oven at 105oC for 24 hours. Lignite and CKS were mixed with a composition of 15%, 22.5%, and 30% by weight of CKS:lignite. The mixture of materials is put into the co-pyrolysis reactor as much as 200 grams. The co-pyrolysis process was carried out at temperatures of 200ºC, 300ºC, and 400ºC for 1 hour by flowing nitrogen gas into the reactor with a flow rate of 1.5 L/min. The results showed that increasing the mixing ratio of CKS:lignite and co-pyrolysis temperature would increase tar yield while decreasing char yield. Judging from the highest tar yield, the optimum co-pyrolysis temperature was 400oC at 15% optimum mixing ratio, while 200oC and 22.5% were optimum co-pyrolysis temperatures and mixing ratio to obtain the largest char yield. Both tar and char co-pyrolysis products can be an alternative energy source with further processing.

Keywords: hybrid coal, palm kernel shell, lignite, co-pyrolysis

PENGARUH TEMPERATUR DAN RASIO PENCAMPURAN TERHADAP DISTRIBUSI PRODUK *CO-PYROLYSIS* LIGNIT DAN CANGKANG KELAPA SAWIT

Abstrak

Adanya isu krisis energi dan masalah lingkungan akibat limbah mendorong terciptanya bahan bakar baru dari bahan terbarukan seperti limbah biomassa cangkang kelapa sawit (CKS). Di sisi lain, batubara kualitas rendah (lignit) memiliki nilai ekonomi yang rendah sehingga perlu ditingkatkan agar dapat digunakan lebih luas. Pemanfaatan lignit dan CKS dapat menghasilkan produk padat (char) berupa batubara hibrida melalui proses *co-pyrolysis.* Penelitian ini bertujuan menentukan temperatur dan komposisi optimum *co-pyrolysis* lignit dan CKS berdasarkan distribusi produk yang dihasilkan. Lignit dikeringkan dan dihaluskan hingga ukuran partikel 20-50 mesh. CKS dibersihkan, dipotong-potong dan diayak hingga berukuran 0,4-2 mm. Selanjutnya CKS dikeringkan menggunakan oven pada 105ºC selama 24 jam. Lignit dan CKS dicampur dengan komposisi 15%, 22,5%, dan 30% berat CKS:lignit. Campuran bahan dimasukkan ke dalam reaktor *co-pyrolysis* sebanyak 200 gram. Proses *co-pyrolysis* dijalankan pada suhu 200ºC, 300ºC, dan 400ºC selama 1 jam dengan mengalirkan gas nitrogen ke dalam reaktor dengan kecepatan alir 1,5 L/menit. Hasil penelitian menunjukkan peningkatan rasio pencampuran CKS:lignit dan temperatur *co-pyrolysis* akan meningkatkan yield tar sementara yield char menurun. Ditinjau dari yield tar terbesar, temperatur optimum *co-pyrolysis* adalah 400ºC pada rasio pencampuran optimum 15%, sedangkan 200ºC dan 22,5% merupakan temperatur *co-pyrolysis* dan rasio pencampuran optimum untuk memperoleh *yield char* terbesar. Baik tar dan *char* produk *co-pyrolysis* ini dapat menjadi salah satu sumber energi alternatif dengan pengolahan lebih lanjut.

Kata kunci: batubara hibrida, cangkang kelapa sawit, lignit, *co-pyrolysis*