

## INTISARI

Pirolisis merupakan dekomposisi termokimia biomassa (bahan organik) menjadi produk yang lebih bermanfaat, melalui pemanasan dalam ketiadaan total oksidator atau sedikit oksigen. Produk pirolisis meliputi *pyrolytic oil* (cair), gas, *char*(arang) serta *wax*(*paraffin*). Dengan adanya proses pirolisis diharapkan dapat menjadi energi terbarukan berupa *pyrolytic oil* sebagai pengganti bahan bakar minyak yang semakin sedikit. Penelitian ini bertujuan untuk mengetahui pengaruh persentase CaO dan zeolit alam sebagai katalis pada proses pirolisis menggunakan bahan baku plastik dan cangkang sawit terhadap sifat fisik dan kimia *pyrolytic oil*.

Pengujian pirolisis menggunakan alat *pyrolyzer* berjenis *fixed bed* beserta sumber panas berasal dari *heater* dengan suhu 500 °C. Bahan baku total yang digunakan sebesar 600 g dengan persentase plastik 50%, cangkang 50%. Sementara itu katalis total yang digunakan sebesar 425 g dengan persentase CaO dan zeolit alam 0%:100%, 25%:75%, 50%:50%, 75%:25% dan 100%:0%.

Penggunaan katalis dapat meningkatkan *pyrolytic oil* dan menurunkan jumlah arang pada hasil pirolisis. Pengujian nilai densitas terendah terletak pada campuran katalis CaO 50% dan zeolit alam 50% sebesar 836,70 Kg/m<sup>3</sup>. Nilai pH tertinggi dimiliki oleh campuran CaO 75%, zeolit alam 25% sebesar 7,45 pH. Sementara itu nilai viskositas paling tinggi pada campuran katalis CaO 50% dan zeolit alam 50% sebesar 4,85 cP. Pengujian nilai kalor yang memperoleh nilai tertinggi berada pada campuran katalis CaO 50%, zeolit alam 50% sebesar 46,17 MJ/Kg. Pengujian GCMS pada campuran CaO 50%, zeolit alam 50% sebesar 80,05% hidrokarbon dan 18,91% oksigenat. Penggunaan dua katalis (CaO dan zeolit alam) dapat meningkatkan kuantitas *pyrolytic oil* hasil pirolisis serta memperbaiki kualitas *pyrolytic oil* yaitu nilai densitas rendah, keasaman rendah, nilai kalor tinggi.

**Kata Kunci** : Pirolisis, *Pyrolytic oil*, Cangkang Sawit, Plastik, Katalis CaO, Katalis Zeolit Alam, GCMS.

## **ABSTRACT**

*Pyrolysis is a thermochemical decomposition of biomass (organic matter) into a more useful product, through heating in the absence of total oxidizing. Pyrolysis products include pyrolytic oil (liquid), gas, char and wax (paraffin). With the pyrolysis process is expected to be renewable energy in the form of pyrolytic oil as a substitute for fuel oil is getting less. This study aims to determine the effect of percentage of CaO and natural zeolite as a catalyst on the pyrolytic oil obtained from plastic and palm shells to determine as raw materials physical and chemical properties.*

*Pyrolysis was performed using fixed bed pyrolyzer equipment and the heat source was generated from heater with temperature 500 °C. The total raw material used was 600 g with 50% plastic, 50% palm kernel shell. Meanwhile, the total catalyst used was 600 g with CaO and natural zeolite ratio = 0%:100%, 25%: 75%, 50%: 50%, 75%: 25% and 100%: 0%.*

*The use of catalysts can increase pyrolytic-oil and reduce the amount of charcoal in pyrolysis results. The lowest density test is located in 50% CaO catalyst mixture and 50% natural zeolite at 836.70 Kg / m<sup>3</sup>. The highest pH value is owned by 75% CaO mixture, 25% natural zeolite at 7.45 pH. Meanwhile the highest viscosity value in 50% CaO catalyst mixture and 50% natural zeolite is 4.85 cP. The calorific value test that obtained the highest value was in catalyst mixture between 50% CaO and 50% natural zeolite at 46.17 MJ / Kg. Testing GCMS on 50% CaO mixture, 50% natural showed zeolite at 80.05% hydrocarbons and 18.91% oxygenate. The use of two catalysts (CaO and natural zeolite) can increase the quantity of pyrolytic-oil produced by pyrolysis and improve the quality of pyrolytic-oil which is low density values, low acidity, high heat values.*

**Keywords:** *Pyrolysis, Pyrolytic-oil, Palm Shell, Plastic, CaO Catalyst, Natural Zeolite Catalyst, GCMS.*