Ko-Pirolisis bonggol jagung dan Polipropilen dalam reaktor tangki berpengaduk untuk produksi bio-oil = Co-Pyrolysis of corn cobs and Polypropylene in a stirred tank reactor to produce bio-oil.

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Abstrak

Previous research of thermal co-pyrolysis of biomass-plastics where plastics function as hydrogen donor to induce synergistic effect on non-oxygenated fraction of bio-oil has reached a condition that there was a difficulty of separating non-oxygenated compounds from oxygenated compounds either at low heating rate. It was suspected that the content of high molecular weight of compounds especially polyaromatic hydrocarbons (PAH) in bio-oil retarded this separation. At low heating rate, most of co-pyrolysis until recently have been conducted in fixed bed and auger reactors. The present work proposed a stirred tank reactor as the reactor alternative to avoid formation of PAH in bio-oil. A series of experiments of co-pyrolysis of corn cobs and polypropylene at low heating rate (5oC/min) with maximum temperature of 500oC has been conducted with the ultimate goal of producing non-oxygenated fraction of bio-oil similar to diesel fuel. The qualities of the fraction targeted were its viscosity, double bond content and branching number of carbon chains. The values of these properties in diesel fuel are 2.7 cStokes, 0%, 0.4, respectively. The experiments involved 3 different reactors, i.e. the first, a stirred tank reactor with its aspect ratio (the ratio of the height to the diameter) of 2.0, the second, a stirred tank reactor with aspect ratio of 1.35 and the third, a dispecement reactor. Nitrogen gas as a sweeping gas was predicted to generate local turbulence favouring convective heat transfer. The work has resulted in some important results, i.e. the first, there was phase separation between oxygenated and non-oxygenated fractions, the second, synergistic effects in copyrolysis have been achieved both in bio-oil and non-oxygenated fraction yields, the third, non-oxygenated fraction had viscosity of 2.03 + 6.47% cStokes, the fourth, nonoxygenated fraction contained only 6-7% double bonds, which eases the hydrogenation reaction in further processing for double bond saturation, the fifth, non-oxygenated fraction had average branching number of 0.57, slightly above that of diesel fuel, which is unfavourable to reach short ignition delay time in the combustion, the sixth, the aspect ratio of the reactor significantly affected the extent of biomass pyrolysis, but not polypropylene pyrolysis.