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# Bioenergy Production from Co-Pyrolysis of Bamboo and Polyethylene Waste

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**Structured Abstract**

**Background:** Fossil fuel overuse leads to harmful environmental impacts, emphasizing the need for alternative energy like lignocellulosic biomass. Pyrolysis, a cost-effective and eco-friendly thermal method. Bamboo, a sustainable alternative to wood, has potential, but mismanaged waste harms ecosystems. Widespread, non-biodegradable plastic use poses environmental threats. Co-pyrolysis, biomass-plastics, is promising for converting plastic waste into biofuel, contributing to sustainable energy. While pyrolysis produces high-quality biofuels, co-pyrolysis improves quality without adverse effects. This method is easy, safe, and reduces carbon emissions compared to fractional distillation.

**Methods:** Pyrolysis is conducted with bamboo biomass by varying the temperature at 600℃ and 900℃ by using Evolved Gas Analysis. Co-pyrolysis experiment is conducted with different blending ratio of bamboo and LLDPE, 2:8, 5:5, and 8:2. The heating rate was 20℃/min. Proximate and ultimate analysis of biomass and plastic were determined by ASTM D444216, ASTM E872-82, and ASTM E177501 standards for moisture, volatile matter,and ash. Carbon, hydrogen, nitrogen, and sulfur where oxygen content was calculated by the difference are analyzed with elemental analyzer. FTIR, GC-MS and XRD were used to determine the functional group, compound, and structure of the solid products.

**Results:** Pyrolysis of a biomass and plastic blend at different ratios and temperatures produced hydrophobic chars with minimal functional groups such as hydroxyl and carbonyl, particularly notable at higher temperatures. Biomass-plastic co-pyrolysis show low biogas yield at both temperatures . Next, both feedstock, control bamboo, 2:8, 5:5, at 600℃ and control bamboo, 5:5 at 900 ℃ shows a well-obtained crystalline structure of biochar. Lastly, 600℃ would be a better option for a higher bio-char yield.

**Conclusion**: All things considered, biomass-plastic co-pyrolysis shows promising results in terms of waste valorization. Through this process, both materials can be converted into valuable products such as bio-gas and bio-char, offering opportunities for sustainable energy production and enevironmental remediation.

**Keywords:** Co-pyrolysis Bamboo, Polyethylene ,Pyrolysis, EGA

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