BIO-OIL FROM AGRICULTURAL WASTE: PYROLYTIC CONVERSION OF TOMATO AND TOBACCO

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Abstract

The growing need to reduce agricultural waste and replace emission from fossil fuels has created a shared research interest. These two areas are complementary, leading to an increased focus on utilizing agricultural waste biomass as an alternative energy source, particularly through the production of liquid and solid biofuels via pyrolysis. Pyrolysis, as a thermochemical process, has gained significant attention for its ability to convert biomass into valuable products, such as bio-oil, which can serve as a renewable energy source, reducing reliance on non-renewable resources. Among the most widely cultivated crops, tomato and tobacco play a significant role in agricultural production. However, the biomass remaining after harvesting, such as stems and leaves, is often left unused, burned, or improperly disposed of, leading to environmental pollution. This biomass, if managed effectively, presents a valuable feedstock for pyrolytic conversion. The pyrolysis of such agricultural waste could provide an opportunity to produce biofuels and other bio-based products, simultaneously reducing waste and generating energy.In this study, the liquid fractions obtained from the pyrolysis of tomato and tobacco biomass were characterized by key parameters such as pH, moisture and ash content, elemental composition, density, viscosity, calorific value, and other relevant analyses. The chemical properties of the bio-oil were carefully analyzed to assess its potential as an alternative fuel. By comparing these parameters with the initial biomass, the potential of the biomass itself as a fuel was evaluated in relation to the bio-oil's characteristics. The study aimed to determine whether pyrolysis could enhance the fuel properties of the biomass, making it more suitable for use in energy generation.The results suggest that the bio-oil exhibits good potential as a high-quality biofuel. Notably, improvements were observed in pH values, a reduction in moisture and oxygen content, and an increase in carbon content and heat value. These changes indicate that the pyrolytic conversion of tomato and tobacco biomass results in bio-oil with improved combustion properties. Additionally, these improvements were further enhanced by the use of catalysts and the addition of materials rich in carbon and hydrogen, such as plastic materials. This demonstrates the potential for optimizing the pyrolysis process to improve the fuel properties of the bio-oil, making it more efficient and suitable for large-scale energy applications.

Keywords: *pyrolysis, agricultural biomass, biofuel production, energy conversion.*

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