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Bio Oil Production Via The Thermochemical Conversion Of Olive Oil Solid Wastes

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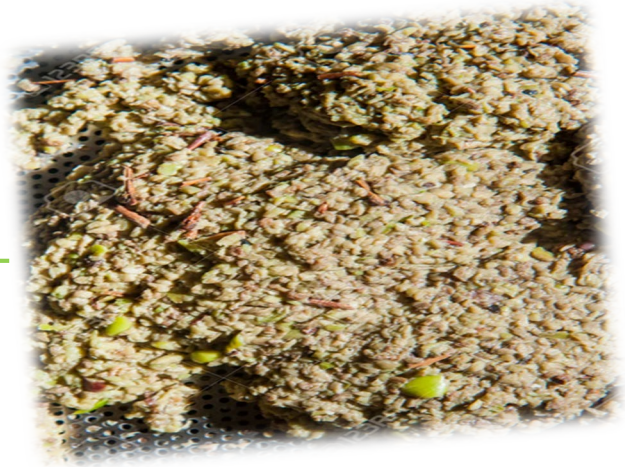
Introduction

The development of population, associated with the consumption of fossil fuels and the environmental problems associated with their use has persuaded the execution of new energy choices to decrease the environmental impact of various practices. Among the most promising sustainable energy the valorization of biomass residues. The most exploited residues are agricultural or agro-industrial waste such as olive pomace, due to their abundance where one ton of olives produces between 200 kg of oil and 550kg of pomace



Olive solid wastes

This amount of olive waste poses constraints, especially when it is discharged without any treatment into the natural environment. Indeed, these discharges have negative effects on the air and even on the microbial population of the soil because of its phytotoxicity, its antimicrobial properties and its polluting by-products

The specific solution to solve this problem consists in its thermochemical valorisation through fast pyrolysis which converts large quantities of residues into useful products (biofuels) that can be used for various purposes such as energy supply or recovery of products with high energy value

Figure 1: Industrial biomass pyrolyser

The main purpose of this study is :

- ❑ To study the effect of temperature and residence time on the yield of pyrolytic products (bio oil)
- ❑ Optimize the optimal conditions for the rapid pyrolysis of olive pomace

Materials & Methods

Pyrolysis is the thermal decomposition of biomass in the absence of oxygen. It is currently one of the most efficient methods to convert large quantities of biomass into useful products (bio oil, bio coal, gas).

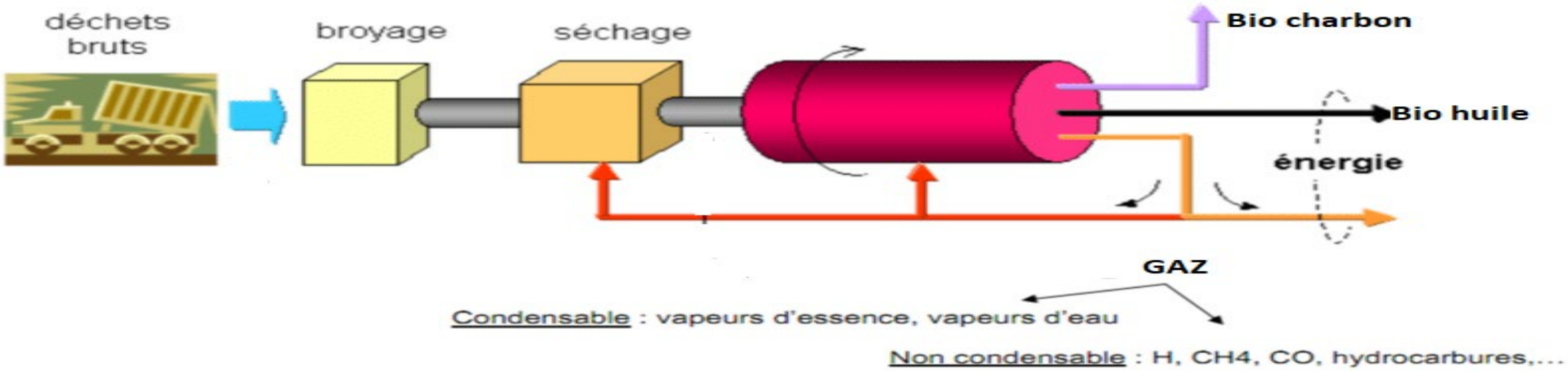


Figure 2- Operating principle of a pyrolysis plant

Materials & Methods

The schematic diagram of the fast pyrolysis As shown in the figure , the pyrolysis plant produces biochar, bio-oil and gas fractions and water from the conversion of biomass . In this study, the fast pyrolysis process was simulated and optimized by Super Pro Designer at a pyrolysis temperature ranging from 450 to 700 °C and a residence time varying between 0.5 and 10s

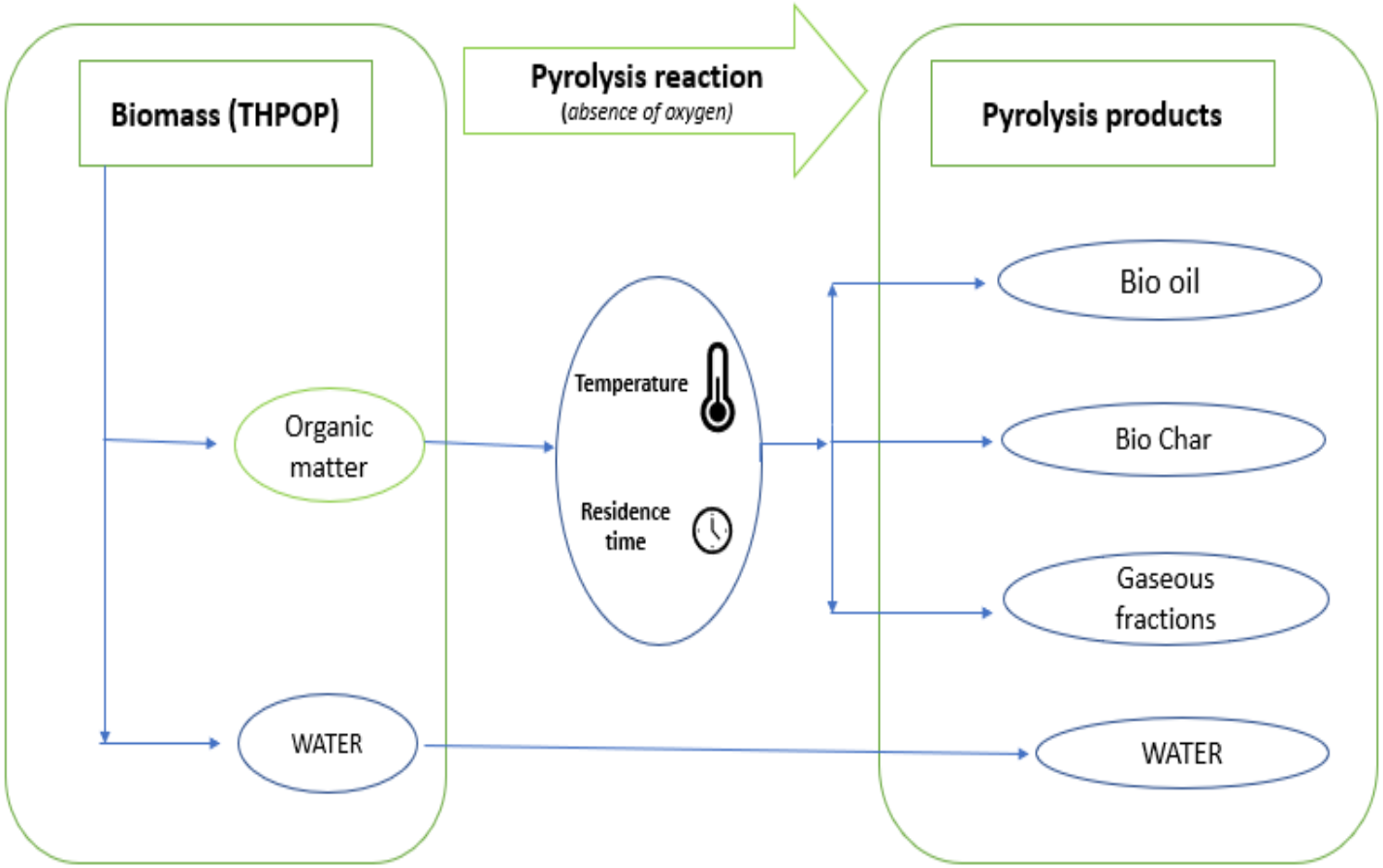


Figure 3- Schematic diagram of the fast pyrolysis process

Results & Discussion

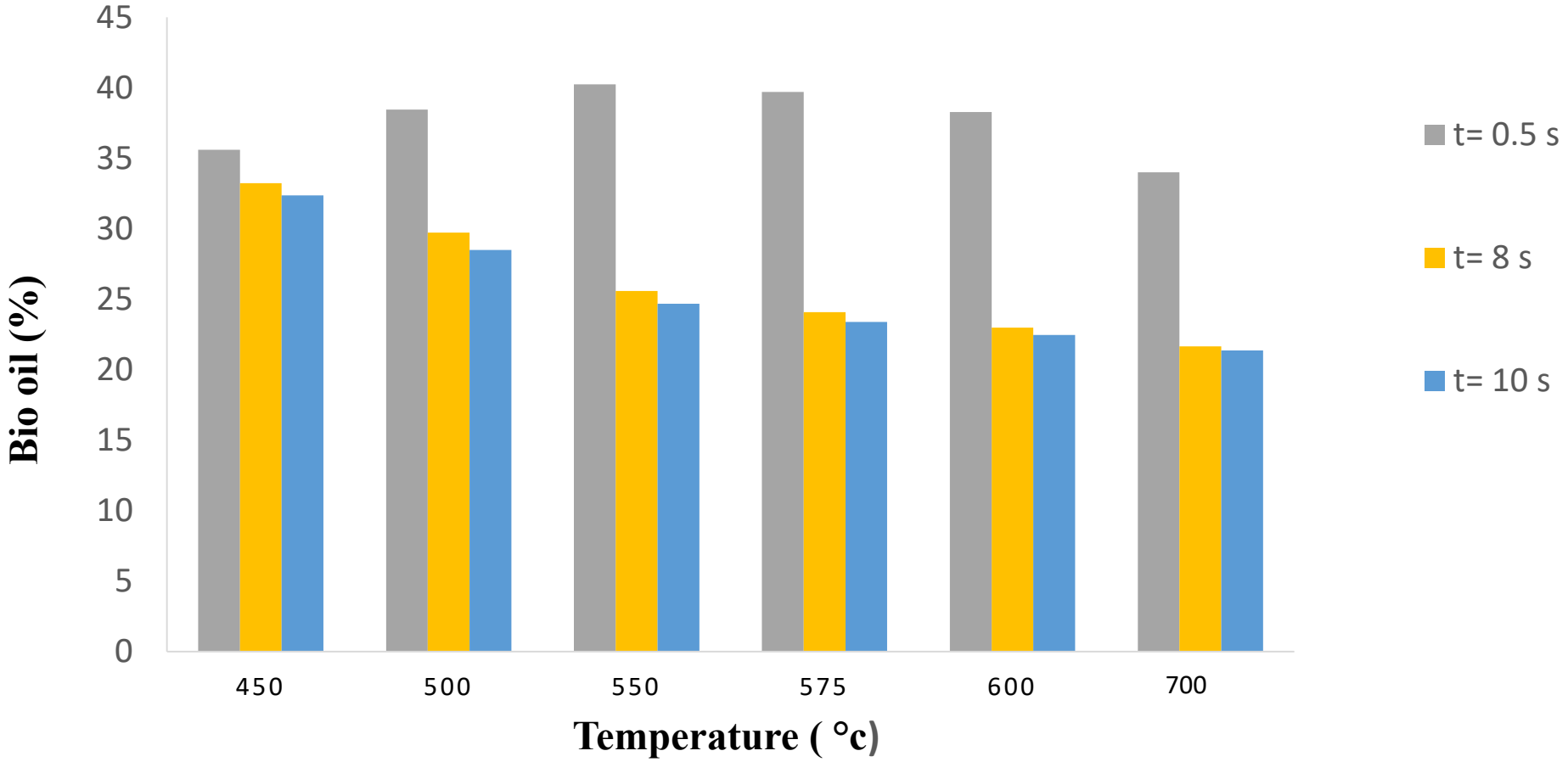


FIGURE 4. THE EFFECT OF TEMPERATURE ON THE BIO-OIL YIELD OF FAST PYROLYSIS OF OLIVE POMACE AT DIFFERENT RESIDENCE TIMES.

Results & Discussion

The pyrolysis process was examined by varying the temperature from 450 to 650 °C , while the residence time was fixed at 0.5 s , 8 s , and 10 s , Figure .4 represents the effect of temperature on the yield of bio-oil from the fast pyrolysis of olive pomace at different residence times. It is noted that by increasing the temperature from 450 ° C to 700 ° C the yield of bio-oil increases until reaching a maximum production of 40.24 % at a pyrolysis temperature of 550 ° C for a residence time of 0.5 s . Thus we notice that by increasing the residence time from 0.5 s to 10 s, the yield of bio-oil decreases.

Conclusion

The olive industry represents a major agricultural sector in the Mediterranean region, generating liquid (margines) and solid (olive pomace) waste with harmful environmental impacts (salinity, acidity and high load of polyphenols). The olive pomace is a biomass that can be treated by pyrolysis. The main objective of this study was to examine the effect of pyrolysis temperature and residence time on the yields of pyrolytic products (bio oil) in order to optimize the optimal conditions of olive pomace pyrolysis

Finally, the comparison between the results presented above indicates that the highest yields of bio-oil are obtained at pyrolysis temperature of 550 °C with low residence time (0.1 -0.5 s)

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for
Your
attention