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Flash pyrolysis of forestry residues from the Portuguese Central Inland Region within the framework of the BioREFINA-Ter project

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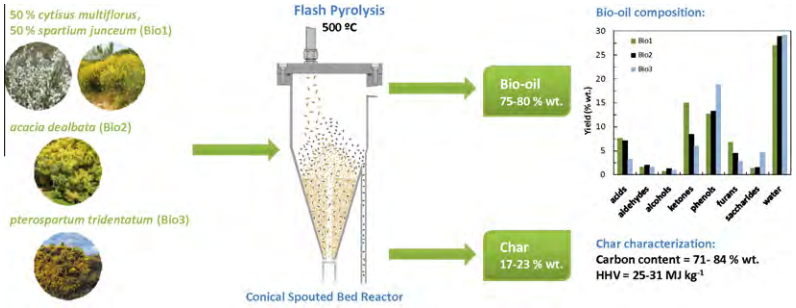
HIGHLIGHTS

- Biomass wastes of Portuguese Central Region can be used as bio-refinery feedstock.
- Spouted bed reactor is suitable for handling irregular texture biomass wastes.
- High bio-oil yields (75–80 wt.%) are obtained for the three residues.
- Bio-oil contains interesting compounds and is adequate for catalytic upgrading.
- The biomass materials could be jointly valorized avoiding separation costs.

GRAPHICAL ABSTRACT



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ABSTRACT

The feasibility of the valorization by flash pyrolysis of forest shrub wastes, namely bushes (*Cytisus multiflorus*, *Spartium junceum*, *Acacia dealbata* and *Pterospartum tridentatum*) has been studied in a conical spouted bed reactor operating at 500 °C, with a continuous biomass feed and char removal. High bio-oil yields in the 75–80 wt.% range have been obtained for all of the materials, with char yields between 16 and 23 wt.% and low gas yields (4–5 wt.%). Bio-oils are composed mainly of water (accounting for a concentration in the 34–40 wt.% range in the bio-oil), phenols, ketones, acids and furans, with lower contents of saccharides, aldehydes and alcohols. Although their composition depends on the raw material, the compounds are similar to those obtained with more conventional feedstocks.

1. Introduction

The alternative routes to obtain fuels and raw materials from biomass have been grouped into the broad concept of bio-refinery, which has been defined as "a facility that integrates biomass conversion processes and equipment to produce fuels, power, and chemicals from biomass" (NREL, 2009). Fig. 1 shows the scheme of the design of a lignocellulosic biomass-based bio-refinery, where several chemical and thermochemical routes, such as gasification, pyrolysis, hydrolysis and anaerobic digestion have been considered. The technological development and industrial application of these processes should be carried out through their incorporation into existing or future refinery processes, with the development of specific valorization routes for biomass (Huber and Corma, 2007).

Biomass flash pyrolysis technology is versatile, simple and requires little capital investment, whereby its deployment on a moderate scale in the regions where the raw material is available can be decoupled from the further upgrading of bio-oil in large scale

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