



# Characterization of co-products from the aqueous waste stream generated during the wood thermal modification process

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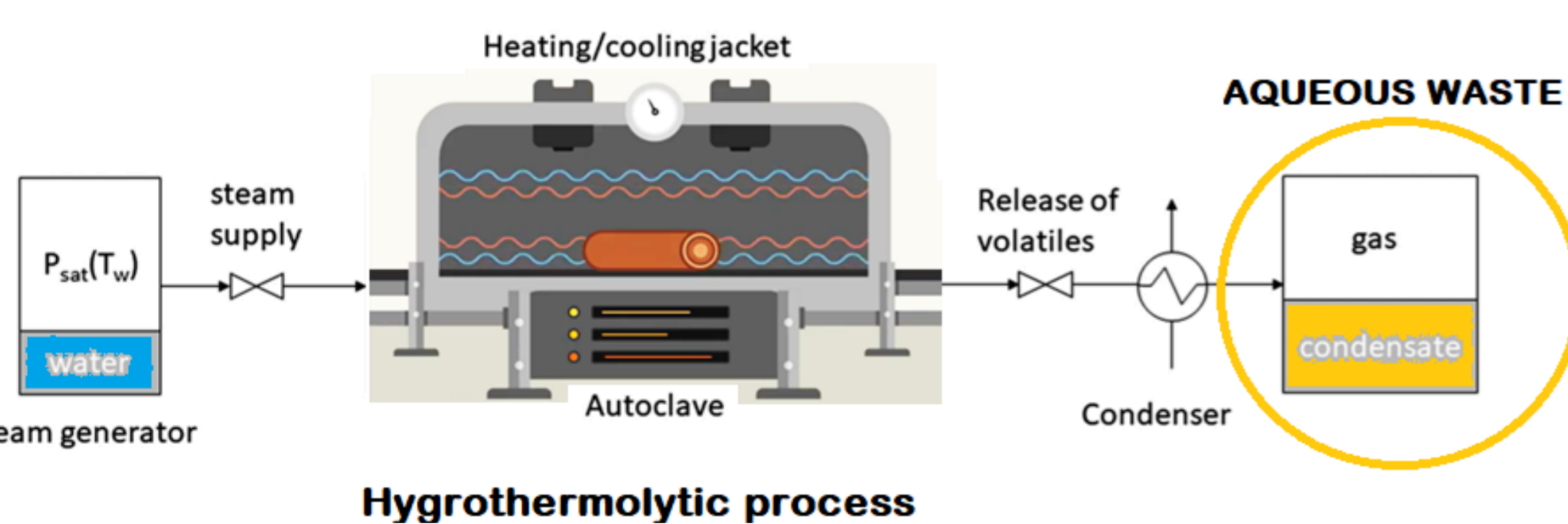
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## Introduction

Wood thermal modification is a chemical-free process developed to improve the durability and prolong the service life of wooden elements. In the hydrothermolytic modification process (patented as Firmolin) the wood is modified in a pressurized unsaturated steam atmosphere at moderated temperature (<180°C) controlling the water activity during the chemical reactions (hydrolysis, dehydration and cross-linking). During the process, secondary aqueous streams are generated that contain heterogenous mixtures of organics from the wood material. Such residues are investigated as a valuable source of bio-based chemicals rather than applying wastewater treatments.

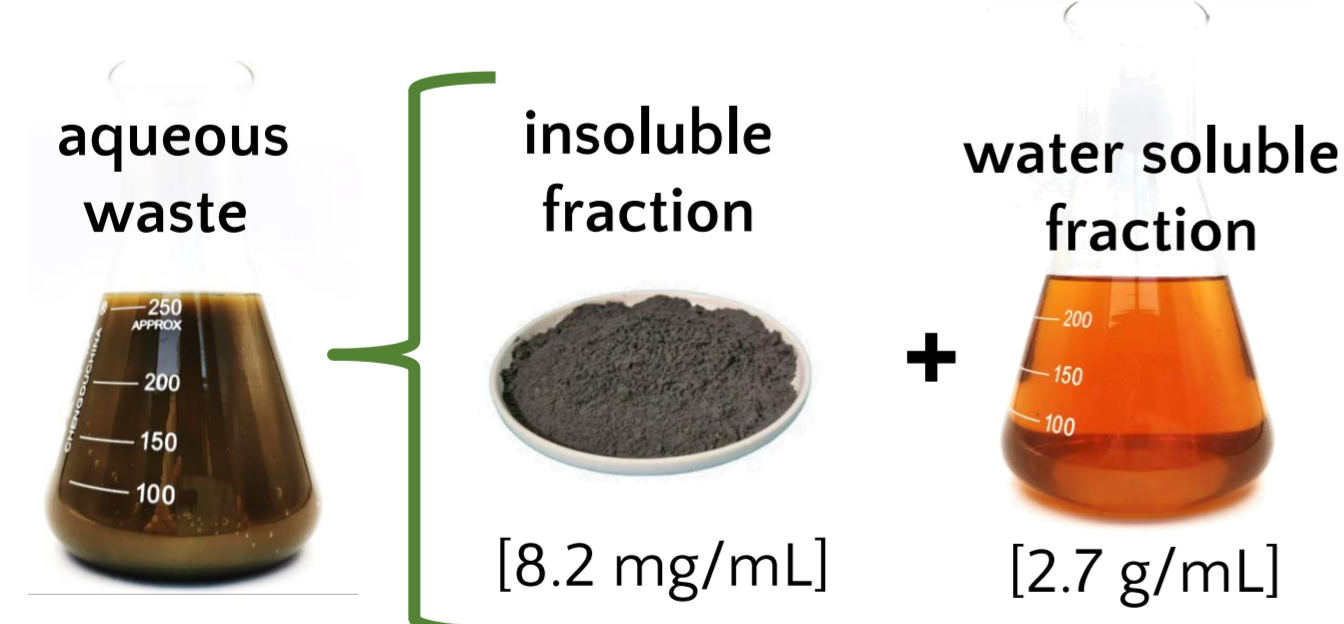
## Material and methods

**Hydrothermolytic modification:** An industrial autoclave reactor was used to modify *Pinus radiata* wood. The system is composed of two connected pressure compartments, one equipped with a fan for steam circulation, and the other heating at a controlled temperature (until 180°C) using the water reservoir. This setting provides fast and accurate control of both vapour temperature and water vapour pressure.



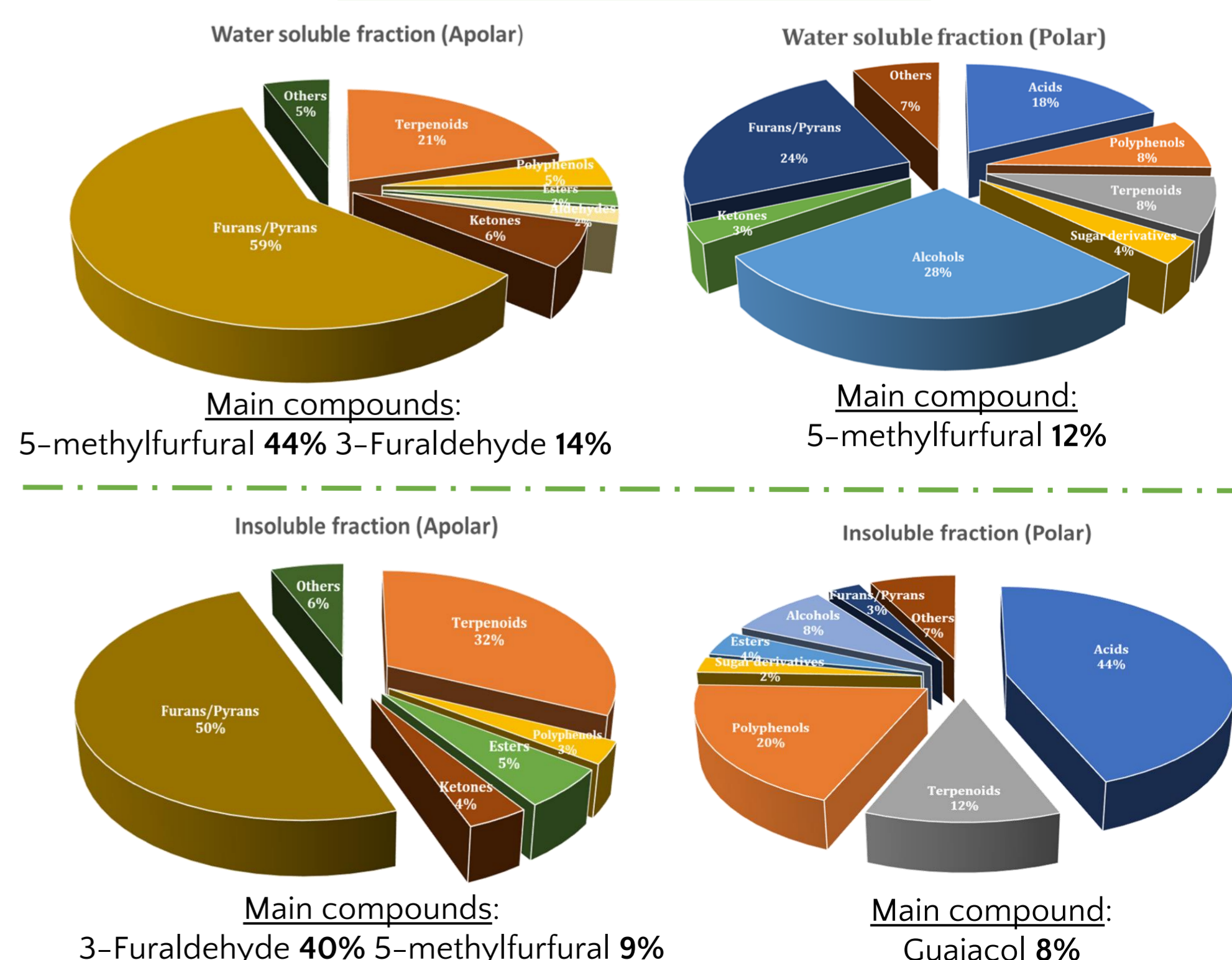
- 1) The aqueous waste was separated in water soluble and insoluble fractions.
- 2) Physical properties were measured (pH, viscosity, density).
- 3) The aqueous waste was separated in polar and apolar compounds and the chemical composition was identified by GC-MS.

## Results



pH = 2.2  
Density = [1.08 g/mL]  
Viscosity 20°C = 1.88 mPa·s  
Viscosity 50°C = 1.39 mPa·s

## Chemical composition



## Conclusions

The preliminary characterization of co-products from the aqueous waste stream generated during the wood thermal modification process showed a rich mixture of compounds with potential applications. The main compounds found by GC-MS were furan derivatives (5-methylfurfural and furaldehyde), and poliphenols (Guaiacol).

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