University of Basilicata
Department of Science

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Thesis Title

"Effect of thermo wood modification and polyoxometalates catalysts on yield and extractives composition"

PhD Course
Chemistry

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Abstract

The aims of this work were to investigate the impact of the heat treatment on the chemical composition (holocellulose, lignin and extractives) of different wood species, to characterise and quantify wood extractives and their composition by GC-MS analysis, to explore the effect of thermo vacuum process on the extractives content and composition, and to use molybdenum catalysts in order to increase the amount of recoverable extractives.

The results showed that there was an increase in the amount of lignin and extractives, and a decrease in the amount of holocellulose following thermo treatment, in the treatment temperature function.

Autoclave treatment of wood with water in the presence of some molybdenum catalysts can increase the amount of extracts, mostly in the presence of microcrystalline $H_3PMo_{12}O_{40}$, but it reduces solubility. Soxhlet extraction of wood with ethanol/toluene mixture in the presence of $H_3PMo_{12}O_{40}$ increased the amount of extractives and their solubility in chloroform, while in the presence of MoO_3 only the solubility of extractives increased.

GC-MS analysis of insoluble fraction showed the presence of myo-inositol and some simple carbohydrates, mainly ribose, xylose and glucose. GC-MS analysis of soluble fraction showed the presence of long-chain acids and fatty acid esters of 10-20 carbon atoms, mainly decanoic acid, hexadecanoic acid, and octadecanoic acid, which can be a source of fatty acids for biodiesel production.

Following the heat treatment and the use of molybdenum catalysts, the increased amount of extractives allowed to obtain valuable amounts of biological and pharmaceutical active compounds.

Furthermore, a new system for the complete separation of triglycerides and fatty acids of wood extractives has been developed: two-dimensional TLC through esterification with $NaOCH_3$ and the use of $AgNO_3$-TLC.