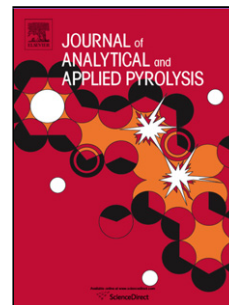


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Structural transformations of wood and cereal biomass components induced by microwave assisted torrefaction with emphasis on extractable value chemicals obtaining

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Highlights

- The structural changes of carbohydrates and lignin caused by MW torrefaction were investigated.
- The MW torrefaction resulted in the increasing yield of hydrophilic extractable materials with high antioxidant activity from aspen wood.
- In wheat straw hydrophilic extracts a flavonoid monomer triclin and its derivatives have been found, which, due to their high antioxidant and cancer preventive activity and low toxicity, are considered as one of a potential added value of wheat straw products.

Abstract

A comparative study of the modification of chemical structure of wheat straw and aspen wood initiated by microwave (MW) assisted torrefaction at different temperatures (150 - 300 °C) was carried out using Py-GC/MS-FID, FTIR, GC-FID and wet chemistry procedures as the main analytical tools. Differences in wood and wheat straw thermal transformations in the course of MW assisted torrefaction were revealed. Formation of extractable chemicals as the result of biomass torrefaction was established. The most significant increase in formation of hydrophilic extractable chemicals was found for the both biomasses after torrefaction in the range of 250 - 280 °C. Antioxidant activity of extracts was assessed by the test with a free radical DPPH[•]. The UPLC-ESI-MS/MS analysis of extracts from the both torrefied biomasses showed the presence of lignin-carbohydrate complex fragments. It was detected that a flavonoid monomer triclin and its derivatives were the dominant compounds in hydrophilic extracts from wheat straw. The results of the study provide useful information for valorization of potentially valuable lignocellulosic destruction products, which can be extracted from torrefied wood and cereal biomass.

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