Assessment of chemical fingerprint of modified wood

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Thermal treatments include several alternative processes that differ in terms of intensity (temperature and duration), treatment atmosphere (vapour/nitrogen/vacuum), use of catalyst, and system configuration (open/close, wet/dry) (Hill 2006). Thermal modification of wood leads to several chemical reactions: dehydration, depolymerisation, degradation, thermo-oxidation. Those reactions take place with different rates depending on the modification process, wood species, process duration and treatment temperature. As a result, chemical composition and in consequence physical properties of wood treated in different processes vary significant.

Exact assessment of changes to particular chemical components is rather difficult, since a range of complex chemical reactions occur simultaneously while exposing wood to elevated temperatures. This manuscript proposes an original approach for visualization of chemical fingerprint of thermally modified wood (Sandak *et al*. 2016). Fourier transform near infrared spectroscopy (FT-NIR) was selected here as technique for fast and non-destructive screening of chemical composition. Selected NIR bands assigned to functional groups of woody polymers were extracted from the spectra and were used as "information hubs", inspired by work of Tsenkova (2013) and her aquagrams concept. Eight European wood species (both softwood and hardwood) were thermally treated under vacuum (250 mbar) for 3 hours in a Thermovacuum processor. Additional details regarding the experimental plant, treatment conditions and applied schedule can be found in Sandak *et al*. (2015).

The new method for spectra visualization, called "xylograms" is capable of highlighting peculiarities in chemical changes to woody polymers due to the thermal treatment. Comparison of xylograms allows observation of kinetic and permits evaluation of thermal stability of investigated species and/or comparison of process parameters influence.

Deep understanding of chemical changes might be helpful for further optimization of thermal treatment procedures at industrial scale. Moreover, xylograms as a simple and illustrative method

might be suitable for visualization of other modification/degradation processes of wood as well as other materials.

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