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CHARACTERISATION OF SUBERINIC ACIDS AND THEIR POTENTIAL APPLICATIONS

Global sustainability challenges prompt the world to modify their strategies and shift from a fossil-fuel-based economy to a bio-resources-based one and to the production of renewable biomass chemicals. Different processes exist that allow the transformation of raw biomass into desirable bio-based products and/or energy. Depolymerized suberinic acids can be considered as an alternative resource to develop bio-polyols that can be further used in polymeric material production.

Birch (*Betula Pendula*) outer bark was used as a raw material to obtain the suberinic acids. Birch outer bark was extracted with ethanol and depolymerized with potassium hydroxide/ethanol solution. By acidifying the filtrate to pH 5.0, 3.0 and 1.0, after washing 1 and 2 times, filtration and drying at 50 °C and 130 °C, 12 suberinic acid fractions were obtained.

In order to determine the chemical properties of obtained suberinic acid samples, several characteristics were determined – total phenolic content (TPC), acid number, saponification number, epoxy groups and hydroxyl number using potentiometric titration. Two instrumental methods also were developed with GC-MS and SEC-RID. GC-MS analysis was performed with 2 separate sample preparation methods to characterise both monomeric fraction as well as polymeric fraction present in suberinic acid samples.

At pH 1, by increasing the drying temperature of suberinic acids, the relative amount of hydroxy acids increases, but at pH 3 and pH 5 the opposite trend is observed. By increasing the drying temperature and the pH value did not change the relative amount of diacids. At pH 5, the relative amount of aromatic compounds decreased when suberinic acid drying temperature was increased. Samples in addition to monomeric fraction also contained a significant amount of polymeric suberin fraction, which cannot be seen by GC-MS without complete hydrolysis. Therefore, two sample preparation methods were used and GC-MS results compared. It was concluded that after depolymerization, all samples are dominated by hydroxy acids separated from the suberin macromolecule. Suberinic acids were tested in bio-polyol synthesis reaction and results were promising.

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