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MORPHOLOGICAL AND STRUCTURAL CHARACTERITATION OF STEAM-EXPLOTED HEMP FIBRES

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ABSTRACT

Cellulosic materials have a great potential for multifunctional nanomaterial formation. They are abundant, renewable, have a self-assembled well-defined nanofibrillar structure. Hemp fibre (cannabis sativa) is one of the plant-based bast fibres and is recently gaining the attention as diversified reinforcing applications in different industry areas. To study the feasibility of extracting cellulose from drew-retted hemp fibres of variety Bialobrzeckie grown in Agricultural Science Centre of Latgale we have adopted steam explosion technique (STEX) along with mild alkali treatment. By using STEX it is possible to decompose natural fibre hirarchial structure down to microfibrilles. Also, lignine and pectine, sugars and other components can be removed by this method. The alkali treatment removes a certain amount of lignin, hemicellulose, wax and oils covering the external surface of the fibre cell wall and depolymerises the native cellulose structure.

To solve problems on further nano-level environment friendly hemp cellulose disintegration influence of pre-treatment intensity, temperature and pressure of steam explosion process are investigated and discussed. The consequences of alkali treatment onto hemp fibres characteristic were measured using scanning electron microscopy and Fourier transform infrared spectroscopy FTIR spectroscopy.
STEX treatment conditions at 220 ^{o}C and pressure 23 bars leads to partly disintegration of hemp fibre bundles. Combination with hydrothermal and alkali treatments allow to remove ~ 26 % constituents including hemicelluloses, pectins/waxes and water.