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Impact of physical pretreatment on thermal properties of coursed sheep wool fibers

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Sheep breeding in Latvia in the last decade is stabilized and continues to develop. Since sheep breeding includes producing of wool, it is important for fabrication of textiles and thermoinsulators. However, annually tons of wool fibers, that do not fit to requirements to be used in textile industry, remain as residues. Such wool can be used as sorbent [1] or convert in activated carbon [2] and use in air filters. In order to increase the area of applications, various treatment methods can be applied, such as chemical [3] or radiation modification [4]. In the present research impact of physical treatment is investigated. Coursed sheep wool was felted (Ltd. Sunakstes Vilnas nams). Non-felted and felted wool was held under various conditions: exposure to light, decreased temperature, moisture, etc. Non-exposed and exposed wool fibers analyzed using thermogravimetry/differential thermal analysis (TG/DTA) method combined with Fourier transform infrared (FTIR) spectrometry. Analysis performed up to 1000℃. Volatile compounds, that are released during heating process, are analysed by registering FTIR spectra with Bruker Vertex 70v equipped with a gas cell and liquid nitrogen – HgCdTe detector.

The obtained results show that coursed sheep wool has three main mass decrease steps, first related with water vapor release, in FTIR spectra are characteristic peaks in ranges of 1500-1700cm-1 and 3000-3700cm-1. Second step is followed by occurring of number of peaks in the FTIR spectra such as at 2850 and 2920cm-1 related to -CH2 and -CH3 groups, CO [5] with maximal intensities around 2180 and 2120cm-1, CO2 centered around 675, 2345 and 3580-3740cm-1 and others. Third main mass loss is followed by release of CO2. TG data show that up to 400℃ the decomposition pattern is similar for both felted and non-felted wool. The obtained results will be used for developing recommendations for producing activated carbon from biofibers.

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