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The Influence of technological factors on the properties of optically transparent nanocellulose films

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Numerous researches have been devoted to the fabrication of high quality polymeric composites derived from renewable resources. Natural fibers have improved properties (low density, low cost, renewability) and ability to replace synthetic fibers such as glass [1]. Nanocellulose is widely used to create new specific nanocomposites and films. Due to high optical properties nanocellulose films are translucent light diffusers and they are applicable for improving the efficiency of optoelectronic devices, such as thin-film silicon solar cells and organic light-emitting devices [2].

Mechanochemical method of the nanocellulose isolation using traditional equipment was proposed in this study. In order to obtain nanocellulose the bleached coniferous pulp was mechanically grinded up to 92 °SR beating rate, hydrolyzed and treated with ultrasound.

Impact of the main technological conditions on properties of the transparent nanocellulose films was studied. The hydrolysis of grinded cellulose suspension was carried out by sulfuric acid with concentration from 20 to 65 % at temperature from 20 to 60 °C during 5 – 60 minutes. The density, tensile strength, Young's modulus and transparency of obtained films were determined. It was established that increasing in acid concentration and duration of hydrolysis increases mechanical properties of films, transparency (up to 82 %) and crystallinity degree (XRD method). Nanosizes of particles in films were proved by TEM-method and thermal stability was analyzed by the TGA-method.

1. *Yao S, Zhu Y.* Nanomaterial-Enabled Stretchable Conductors: Strategies, Materials and Devices.// Advanced Materials. – 2015. – N 27. – P. 1480–1511.
2. *Tassi W. W., Nancy G., Hongl Z.* Nanocellulose-based translucent diffuser for optoelectronic device applications with dramatic improvement of light coupling.// Applied materials and interfaces. – 2015. – 7, N 48. – P. 26860 – 26864.