ed to the charge accumulation on the GO surface in a polymer solution jet while electrospinning, i.e. leading to electrostatic repulsions [5].

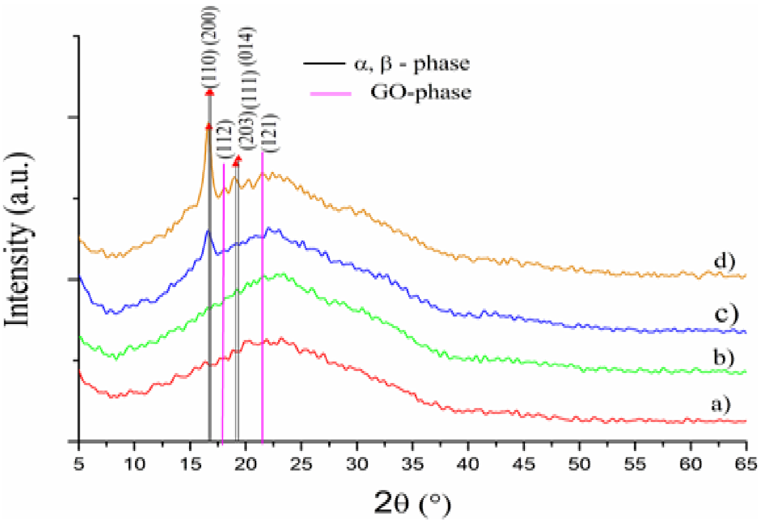

Fig. 1. *XRD patterns of (a) pure PLLA scaffold and with (b) 0.2 %, (c) 0.7 %, (d) 1 % GO doping*

X-ray diffraction analysis was used to study the crystalline structure of the prepared hybrid scaffolds. For pure PLLA, no sharp peaks were observed in XRD patterns (Figure 1), likely indicating the presence of amorphous or nanocrystalline structure [6]. Meanwhile, 0.7 % and 1 % GO content resulted in the appearance of two new peaks observed at 16.7 ° and 19.1 °, which can be assigned to (200)/(110) and (014)/(203) planes of α-phase or (200)/(110) and (111) planes of β-phase of PLLA, respectively [6, 7]. In addition, due to the increased GO content (1 %), XRD patterns revealed a (112) plane of GO in PLLA scaffolds.

Conclusion. Defect-free PLLA fibers with GO doping were sucessfully fabricated using electrospinning. SEM analysis showed that the increase of GO content resulted in the formation of thinner fibers. XRD analysis demonstrated the formation of the crystalline PLLA structure in the electrospun scaffolds with GO doping at 0.7 % and 1 %.

Acknowledgment. The present study was finincially supported by Russian Science Foundation 18-73-10050.

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PREPARATION AND CHARACTERIZATION OF POROUS PTFE MEMBRANES PREPARED BY ELECTROSPINNING METHOD

I.M. Kolesnik
Scientific supervisor – PhD, research fellow E.N. Bolbasov

National Research Tomsk Polytechnic University
634050, Russia, Tomsk, 30 Lenin Avenue, kolesnik0796@gmail.com

Materials with good mechanical properties and excellent hydrophobicity are applicable for the purification of gases, osmotic distillation (OM), membrane distillation (MD), and their varieties. One of this group of materials is polytetrafluoroethylene (PTFE) – a fluoropolymer synthesized by tetrafluoroethylene polymerization at high pressure [1]. Owing to its high chemical and thermal stability, good dielectric, hydrophobic properties, and excellent mechanical characteristics, PTFE is utilized in chemical technology for manufacturing of chemical reactors, chemical-resistant pipes, and membranes for various types of purification [2].

The main methods for the manufacture of PTFE-based membranes are biaxial stretching, laser ablation, and the method using pore-forming reagents. The disadvantages of these methods are difficulties with manufacturing of thin membranes with a high degree of pore interconnectivity and

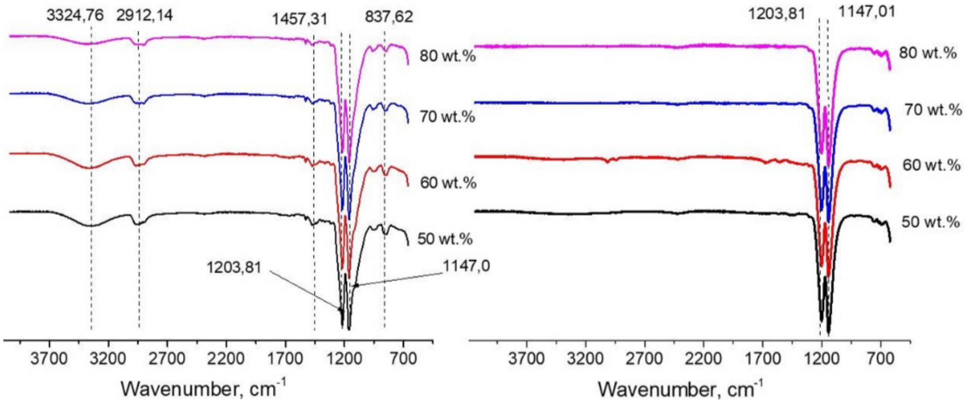

Fig. 1. *FTIR spectra of PTFE porous materials: a – spectrum of precursor materials, b – spectrum of materials after sintering*

usage of environmental-unfriendly plasticizers, and other reagents.

The electrospinning of polymer solutions is a promising method for production of porous polymer materials. It provides capability to form constructions with high porosity at small thikness, surface-to-volume ratio, and good mechanical characteristics for various applications: drug delivery, biosensors, and membranes for MD, OD, and water purification. However, direct formation from PTFE solutions is impossible because of the lack of suitable solvents for PTFE. However, PTFE porous membranes may be synthesized by electrospinning with fiber-forming polymer, such as polyvinyl alcohol (PVA).

Materials and methods. A spinning solution that was comprised of a PTFE suspension and a 9 wt.% aqueous solution of polyvinyl alcohol (PVA). For investigation 4 groups of materials were formed in such way that the content of the PTFE suspension in the solution was 50, 60, 70, and 80 wt.%. Nonwoven materials were formed by the electrospinning method on Nanon-01 (MECC, Japan) under following conditions: voltage – 25 kV, flow rate – 2 ml/h. After formation the precursor membranes were heated to 360±10 °C at a rate of 5±1 °C/h in atmospheric pressure and then cooled to room temperature. Chemical structure of the fabricated porous materials before and after sintering was investigated by Fourier transform infrared (FTIR) spectroscopy using Cary 630 spectrometer (Agilent, USA).

Results and discussions. Confirmation of the removal of water and PVA from PTFE membranes after sintering was approved by FTIR spectroscopy, results of which are presented in Figure 1.

In the FTIR spectrum of PTFE precursor membranes (Figure 1a) the highest absorbance is observed at 1 203 and 1 147 cm^{-1} that corresponds to asymmetric and symmetric stretching of $C–F_2$ in PTFE. At 3 325, 2 912, 1 457, and 838 cm^{-1} the stretching of O–H, asymmetric stretching of $C–H_2$, asymmetric bending of $C–H_2$, and stretching of C–C, respectively, are detected that correlate with the presence of PVA in the precursor membranes. After sintering process (Figure 1b) the strong absorbance peaks at 1 204 and 1 147 cm^{-1} are only observed that approve full decomposition of PVA.

Conclusion. Porous materials based on PTFE were fabricated by electrospinning with sintering of precursor membranes. After sintering process, the full decomposition of PVA and surfactant was observed. The combination of high hydrophobicity and porosity allows to utilize obtained membranes as selective ones, for example, for cleaning oils from water contaminants.

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