

NANOFIBROUS BIOLOGICALLY SOLUBLE SCAFFOLDS AS AN EFFECTIVE DRUG DELIVERY SYSTEM

Chingis Daulbayev^{1,2}, Fail Sultanov^{1,2*}, Maiya Aldasheva³, Aliya Abdybekova⁴,
Baglan Bakbolat^{1,2}, Mohammad Shams^{1,2}, Aruzhan Chekiyeva⁵, Zulkhair Mansurov^{1,2}

¹al-Farabi Kazakh National University, Almaty, Kazakhstan, 050038

²Institute of Combustion Problems, Almaty, Kazakhstan, 050012

³S.D. Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan, 050012

⁴Kazakh Medical University of Continuing Education, Almaty, Kazakhstan, 050040

⁵K.I. Satbayev Kazakh National Research Technical University, Almaty, Kazakhstan, 050013

*Corresponding author: fail_bk@bk.ru

Address: Bogenbay Batyr str., 172, Almaty, Kazakhstan

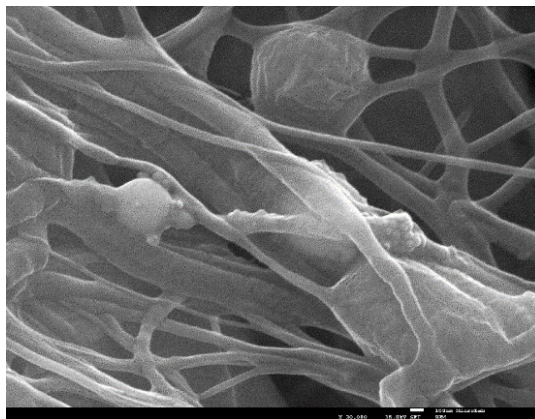
Table 1 presents the main parameters of the electroforming process.

Table 1 - The parameters of the process of electroforming nano-sized fibers

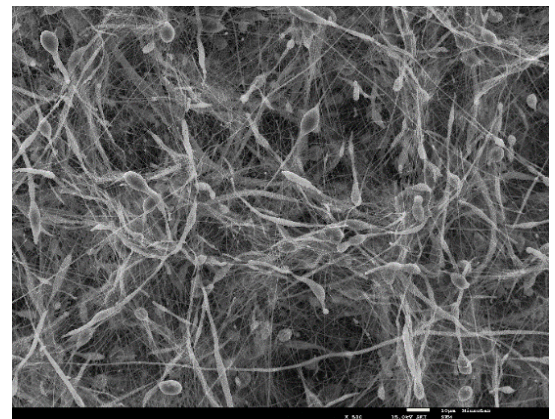
Experiment series number	Rate of precursor feed, ml/h	The value of high voltage, kV	The ratio of polymer to solvent, %	The distance from the needle to the collector, cm	Diameter of nano-size fibers, nm
1	3	20	25/75	16	650
2	2.5	18	20/80	17	450
3	2	17	15/85	18	300
4	1.5	15	10/90	15	100-200

From Table 1, the higher the polymer to solvent ratio, the larger the size of the fibers, which is explained by hydrodynamic processes. The effect of the rate of feed of the precursor, which ranged from 0.5 to 3 ml/h, on the diameter of the nano-sized fibers is caused by the formation of the Taylor cone. The distance from the needle to the collector was chosen so that the average diameters of the formed fibers were minimal (less than 200 nm). As a result of the experiments, optimal conditions for the process of electroforming nano-sized fibers based on PCL were found, and they are presented as 4th experiment series in Table 1.

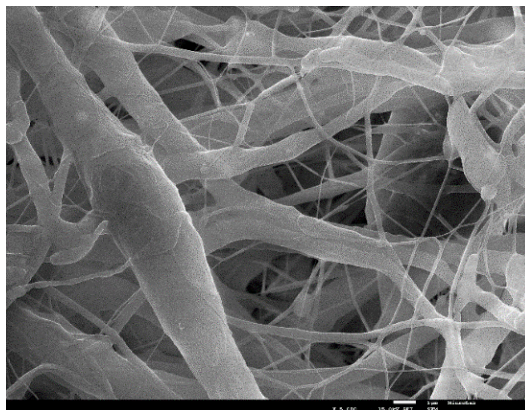
Figure 1 shows the SEM images of the surface morphology of the obtained fibers based on PAN with various process parameters, in order to determine their optimal values. Figure 1a corresponds to the series of experiments No. 1, presented in Table 1, b - series No. 2, c and d to series No. 3 and No. 4, respectively.



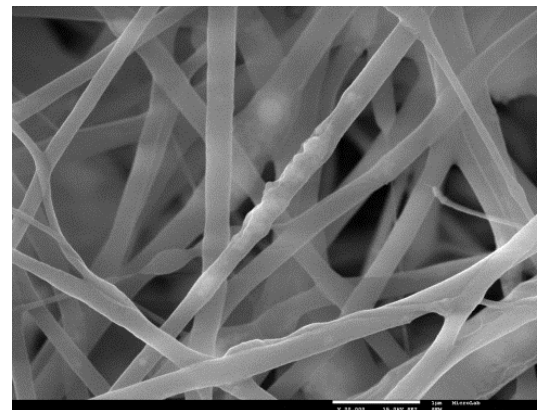
a



b



c



d

Figure 1 - SEM images of nano-sized fibers obtained under different parameters of the electroforming process

From Figures 1a, 1b, 1c, where the surface morphology of obtained fibers is presented, it is clear that under these parameters the process of electroforming of fibers is unstable. Average diameter of formed fibers under these parameters of electroforming process is 650, 450 and 300 nm.

From figure 1d it is can be seen that average diameter of obtained fibers is 100 nm and these fibers were obtained at following parameters of electroforming process: a high voltage of 15 kV, the rate of feed of the syringe pump was 0.5 ml/h and a distance from the needle to collector was 15 cm (see experiment series No. 4, Table 1).

Thus, the study of the main parameters of the electroforming process of nano-sized fibers for photocatalytic coatings was carried out. The optimal parameters of the process of electroforming fibers with a diameter of up to 100 nm based on PCL are: the distance from the needle to the collector is 15 cm, the rate of feed of the syringe pump is 0.5 ml/h, the high voltage value is 15 kV.