ELECTROSPUN NANOFIBROUS WEBS AND DISTRIBUTIONS OF NANOFIBERS POROSITY

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Different structures of nanofiber, such as coreshell, bicomponent, hollow and porous structures, could be produced by using special designs of spinnerets. Functionalizing nanofibers with super active surface properties can be produced by controlling nanofiber body size, mass and content. Special nanofiber morphologies and textures can be utilized in advanced applications, such as nanofluidics, catalysis, drug delivery and release, nano supports, energy storage and gas sensors.

One of parameter which characterises the structure of nanofibrous web is porosity. A very important parameter for describing porosity is the maximum value of the pore diameter in the surface of electrospun web. Such evaluation is especially important for nanofibrous webs of barrier application, which are used, for example, for antimicrobial protection. Preliminary analysis of webs shows a very big inequality of pore diameters in different places of nanowebs. There are a few methods for measuring the porosity such as conventional methods using apparent density and bulk density, image analysis and mercury porometer. On the other hand, the analysis of webs show a very big inequality of pore diameters in different places of nanowebs, but this inequality has not been fully investigated yet [1,3].

Porosity is also very important if the electrically spiked nano-formed cells are used for cell growth or barrier properties. In these cases, not only the maximum size of the pore, but also all the distribution of pores size are important. Many authors describe in their work the porosity of the structure of the nanoweb, but the papers do not provide porosity estimation methods [2]. The high porosity and microstructure of bio-aggregates are fundamental to their physical properties. Typically they have a low density and a complex pore structure. This has two principal effects. In the first instance, low density is associated with low strength, but also with low thermal conductivity. For this reason most bio-aggregates are not suitable for use as structural materials, but are eminently suited to act as a low density filler in composite materials conferring low thermal conductivity on the resulting bio-composite.

[1] Malašauskiene J., Milašius R., Mathematical Analysis of the Diameter Distribution of Electrospun Nanofibres. Fibres & Textiles in Eastern Europe, Vol. 18, No. 6 (83) p. 45-48, 2010.
[2] Kleivaitė V., Milašius R., Electrospinning – 100 Years of investigations and still open questions of web structure estimination. Autex Reasearch Journal, Vol. 18, No 4, December 2018.
[3] Brochocka A., Efficiency of electret polycarbonate nonwovens in respiratory protection against nanoparticles. Autex Reasearch Journal, Vol. 17, No 2. 2017.