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Performance of the deep bed filter at its loading with particles and microorganisms

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The deep-bed filtration technique is one of the most effective available water purification methods. The real fibrous filter performance emphasizes during its loading, when the deposits gradually change a filtration space. The evolution of temporary filtration efficiency, pressure drop and dust capacity characterizes filter quality. This work is focused on the behavior of filter loading with abiotic and biotic objects presented in the water stream. Multilayer gradient and composite micro- and nanofibrous cartridges were produced for testing using the melt-blown technology. The entire filtration time was divided into 5 periods. After each period of time the tested filter was dried and stratified into layers differing in fiber diameter and porosity. The retention capacity of each layer was calculated gravimetrically. Porosity of the initial fibrous structure and the structure loaded with the deposit collected on the fibers was determined using a scanning electron microscopy in 2-dimentional space. Experimental data presents the time developing values of filtration efficiency and pressure drop for each type of the tested filters. Results show qualitative difference of filters behavior depending on their initial structure. Deposits are distributed inside the cartridge with different manner. When bacteria are present in the water stream, the biofouling due to their intrinsic colonization significantly changes the filter loading. The introduction of nanocomposite Ag and ZnO particle on the filter fiber significantly reduces this effect, according of our measurements.

Biography

Leon Gradon is a tenured Professor of Chemical Engineering at Warsaw University of Technology with 45 years of academic and research experience. He is the author and co-author of 19 monographs and chapters, 4 academic books, over 220 per-reviewed papers in scientific international journals and 65 patents. Several applications of his inventions at technical scale are ultrasonic nebulizer, pneumatic nebulizer, bag filters, disposable respirators, dry powder inhaler and diesel engine filters. He is an Editorial Board Member in four international journals: *Chemical and Process Engineering Journal, International Journal Occupational Safety and Ergonomics, Journal of Aerosol in Medicine, KONA Powder and Particles* and *Advanced Powder Technology*.

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