

## *Abstract*

In this work, the preparation of PVA and Nylon6 membranes by electrospinning has been studied. The influence of processing parameters, i.e., applied voltage, flow rate, spinneret-to-collector distance and temperature have been investigated. More comprehensive characterizations of the nanofiber membranes, including fiber diameter, pore size by statistical determination from (SEM) images, porosity, thickness, basic weight and tensile strength as well as air filter efficiency have been investigated. PVA has been dissolved in distilled water at concentration (10% wt). The polymer solution was electrospun under processing conditions i.e., an applied voltage of (5,10,15,20,25 kV), a needle tip- collector distance of (4,8,12,15,20,22cm), a flow rate of (0.2,0.5,0.8,1,10mL/hr), and temperature (25,30,35,40,45,50 C) , using orifice size of spinneret is (0.6 mm), stationary substrate set-up, aluminum collector. Nylon 6 has been dissolved in formic acid at concentration (10% wt). The polymer solution has been electrospun under processing conditions: applied voltage (25KV), flow rate (0.2-0.3 ml/hr), collection distance (20cm), at (25C). When the high voltage is increased with constant other parameters, the electrostatic force will increase until the polymer surface tension is overcome, allowing a charged jet of polymer to escape from the tip of needle and travel to the collector. The best applied voltage obtained is (25 KV). When the flow rate is increased with fixing other parameters constant, more polymer solution is ejected, increasing the flow rate too high, more smooth flattened fibers and merged. In accordance with obtained results, the optimum solution flow rates have been obtained to be (0.2ml/h) and (0.5ml/h). The effect of needle tip-collector distance has been studied by a series of experiments which have been carried out with constant other parameters. It shows the average fiber diameter has a slight decrease trend from (857 nm) at the distances of (4cm) to (600nm) at distance of (22cm). Possibly the larger distances increase flight time of the jet, stretching

of the solution so the solvent had enough time to evaporate completely. Experiments have been done at range of temperature between (25-50) °C. The effects of ambient temperature of surrounding environment of spinning area and found that fiber diameters are temperature dependent and by increasing temperature, average fiber diameter decreased and notice high regularity of fibers with no beads there found. But when decrease in ambient temperature will result in reduction of solvent evaporation rate and longer jet solidification time and all lead to decrease in the average fibers diameter.

Optimum conditions of nanofibers fabrication was selected to prepare membrane of (PVA) are long, continuous, and flexible with diameters in the range of (50 – 200) nm (25KV, 0.2 ml/hr, 20cm and 45 C). Membrane has been prepared at optimum conditions, by directly electrospinning nanofibers as thin layer on the surface of the microfiber for each (PVA and Nylon6). This has improved the performance of filtration. The polymer filter media have been tested for aerosol filtration. Such the results show that, electrospun nanofiber (PVA) and (Nylon6) membranes can be used in various applications such as removal of nano or microparticles from air.