CONTROLLING STRUCTURES AND FILTRATION PROPERTIES OF HIGH SURFACE AREA SPUNBOND NONWOVENS

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It is well known that small fiber sizes are highly desirable to achieve higher filtration efficiency. However, due to low bending and torsional rigidity of fine fibers, filter media consists of smaller fibers tend to collapse more easily resulting in denser structures and it leads to higher pressure drops and low permeability. Obviously it is desired to keep the resistance of a filter as low as possible as the pressure drops is directly correlated to the energy necessary to push the contaminated air through the structure. Thus, having ability to create filtration media with small fiber sizes and also low densities would certainly reveal new opportunities. In this study we report on the effect of various hydroentangling parameters, such as jet spacing, manifold pressure, number of manifolds but also specific energy on the structure and filtration properties of high surface area nonwoven materials created with bicomponent spunbond technology. Various bicomponent fiber configuration were also studied.

S4.3.2 Faraday Bucket Measurement of Charged Pvdf Nanofibers

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Electrospun polymeric nanofibers are three-dimensional porous structures with high surface to volume ratio. They find use in numerous applications where materials having large surface area are needed. Some polymeric nanofibers are piezoelectric in nature, such as polyvinylidene difluoride (PVDF), and can act as electrets due to their molecular orientation. An electret is a dielectric material that has a quasi-permanent electric charge. The surface charge density (SCD) of polymeric piezoelectric materials can be exploited in several emerging applications such as sensors, semi-conductors and water purification and treatment techniques such as membrane distillation.

Electrospun fibers, depending on the polymer material, may inherently exhibit stored electrical charges. There are a number of techniques reported in literature for inducing charges into fiber mats. One common issue is measurement of the amount of charge in a fiber mat. In this paper a custom made Faraday bucket is described for measurement of the charge on the fiber mat. Experimental challenges to achieve consistent, reproducible charge measurements are discussed. Measurements of PVDF samples are compared to charges on other common fiber materials. Applications of the Faraday bucket in experiments to (1) assess methods for storing charged fiber mats and (2) evaluate the decay rate of charged fiber mats are discussed.