S2.2.3 and PP7 - *Charged Aligned Fiber Yarns*

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Filter media are typically made up of electrospun fibers collected in randomly aligned flat mats of low mass. The random orientation of the fibers and low basis weights result in a relatively low mechanical strength. Furthermore, one of the effective methods to charge piezoelectric fibers such as PVDF is by stretching the fibers. When an electrospun fiber mat is stretched, many of the fibers that are not oriented in the direction of the stretch do not experience the desired stretch. During stretching, the fibers may re-position relative to each other instead of stretch. Hence, the action of the stretch on the randomly oriented fiber mat is not as effective at creating the piezoelectric effect as one would expect from an experience with a stretch of sheets of thin films. To improve the effectiveness of the stretch, ideally, the fibers should be more closely oriented in the stretch direction. Potentially, if the electrospun fibers are formed into yarns instead of mats, then more of the fibers may be aligned along the yarn axis. This work explores the formation of aligned fibers into yarn and the effect on charge treatment parameters of stretching, heating, and poling. In this research electrospun fiber yarns are produced using a custom-built electrospinning yarn-winding device. As-spun and treated yarns are compared for polarization by studying morphology and mechanical

properties. Advantages of these electrospun fiber yarns are: continuous production of highly aligned/ twisted fibers, uniform evenness, long length fibers, increased charge, and mechanical properties, better handling, and storage.

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