Supporting Information

Increasing ionic conductivity within thermoplastics via commercial additives results in a dramatic decrease in fiber diameter from melt electrospinning

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Experimental results demonstrate that the LLDPE melt viscosity has no predictive effect on jet size but there is a clear trend with conductivity. **Figure S1** plots observed jet radius and fiber diameter versus viscosity and conductivity. DNDA (η = 60 – 70 Pa-s) and ASPUN (η = 250 – 300 Pa-s) r_{jet} values range from 20 – 60 μm and 20 – 50 μm, respectively (Figure S1a). Figure S1b shows r_{jet} as a function of measured conductivity where the downward trend with conductivity raised to the power -0.25 (as in Equation 7) is evident.

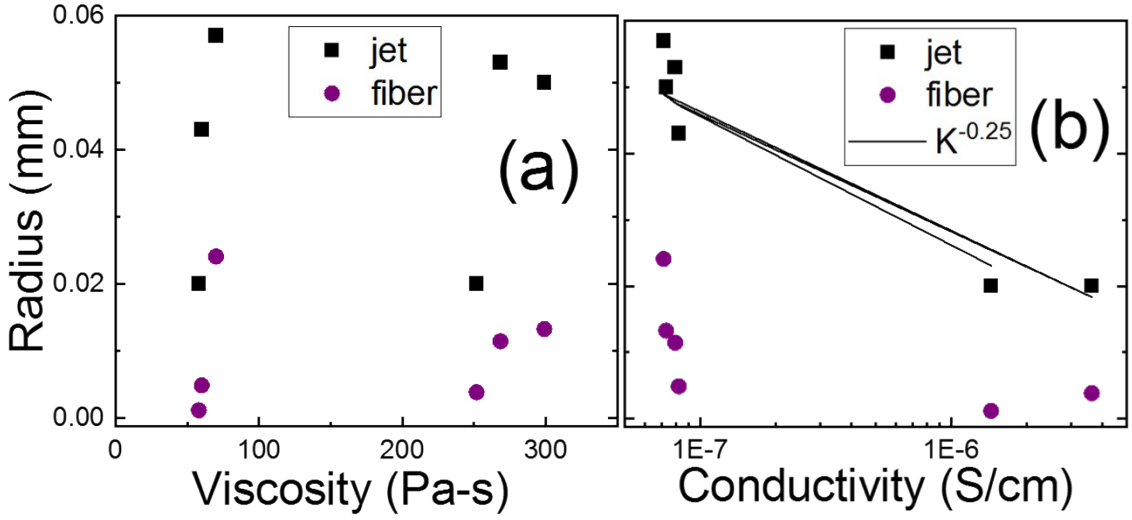

Figure S1. a) Jet and ultimate fiber size show no dependence on melt viscosity for either LLDPE formulation. b) Jet size decreases as melt conductivity increases. The line is conductivity raised to the -0.25 power.

Figure S2 shows an expanded view of the lower histogram panels of Figure 10 for easier viewing of the results for ASPUN (Figure S2a) and DNDA (Figure S2b). Increasing the melt conductivity results in a significant increase in fraction of fibers produced with sub-micron diameters: for example, for DNDA + 5 wt% FA38 20% of the fibers created were nanoscale (< 1 μm), as compared with 0% for the neat DNDA.

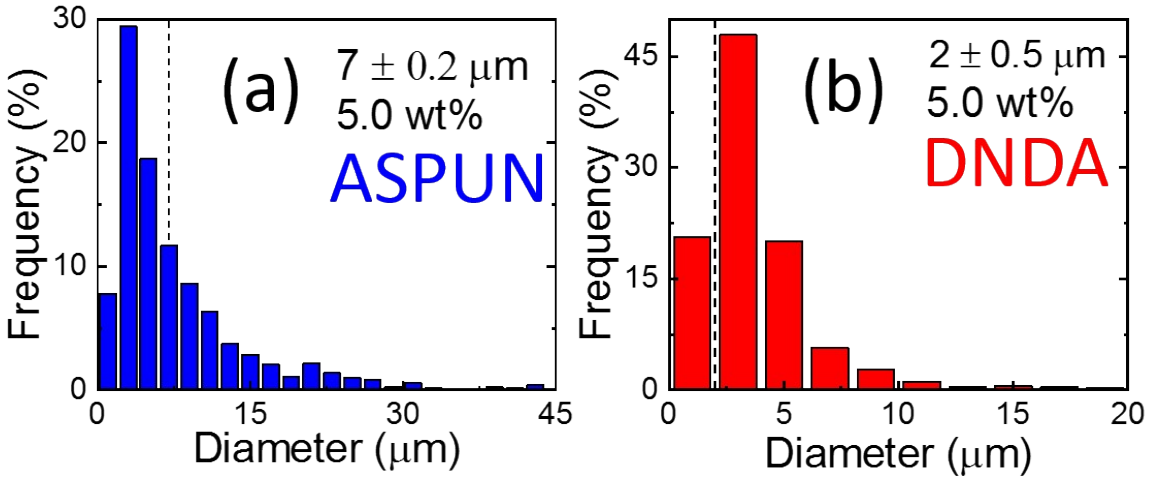

Figure S2. Expanded histogram graphs of fiber diameter distributions for different LLDPE formulations with 5.0 wt% FA38 additive loading for a) ASPUN (blue data) and b) DNDA (red data), respectively.

The melt electrospinning apparatus (**Figure S3**) consists of a single piece of aluminum machined to create the source plate, onto which a replaceable tungsten carbide-tipped blade attaches (flush to the plate surface) with countersunk screws. The blade provides a consistent, sharp plate edge that is more resistant to scratches and defects when cleaning. The blade's length was adjusted slightly to enable a tight connection.

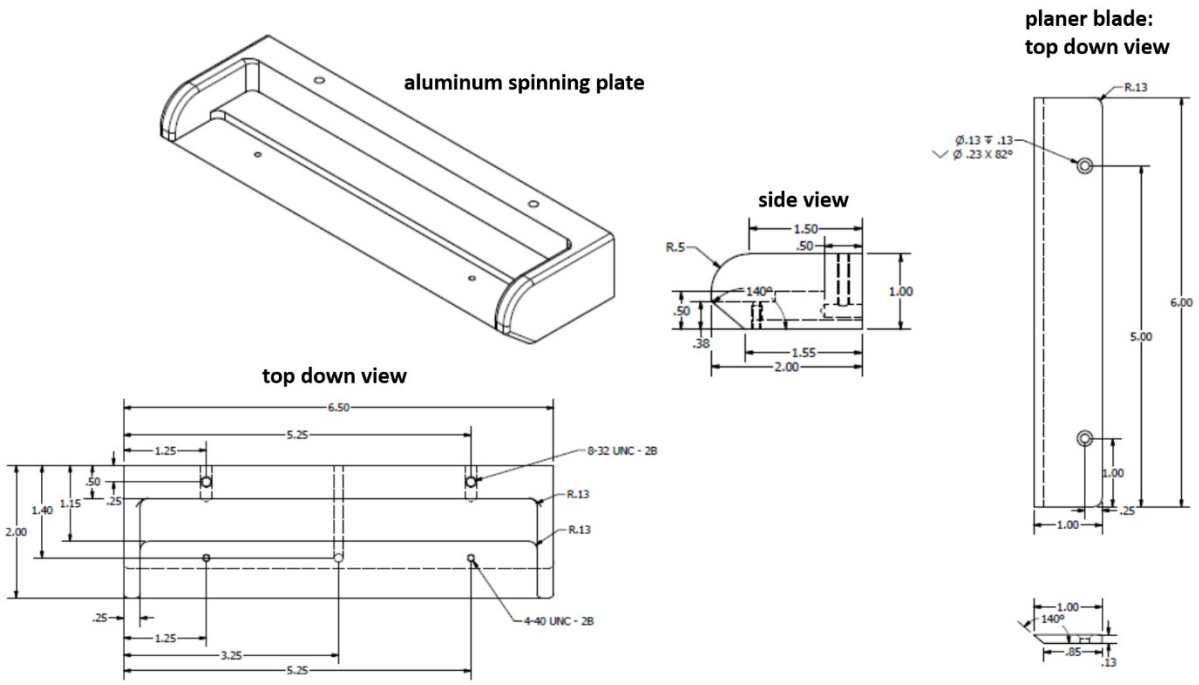

Figure S3. Drawings of the source plate and planer blade. Dimensions are given in inches.