Effect of Corona Charging, Additive and Processing Conditions on the Barrier and Filtration Properties of Polypropylene Meltblowns

Partha Sikdar*[a], Gajanan S Bhat [a]

[a] Department of Textiles, Merchandising and Interiors, University of Georgia, Athens, GA, USA.

E-mail: ppprs92@gmail.com.

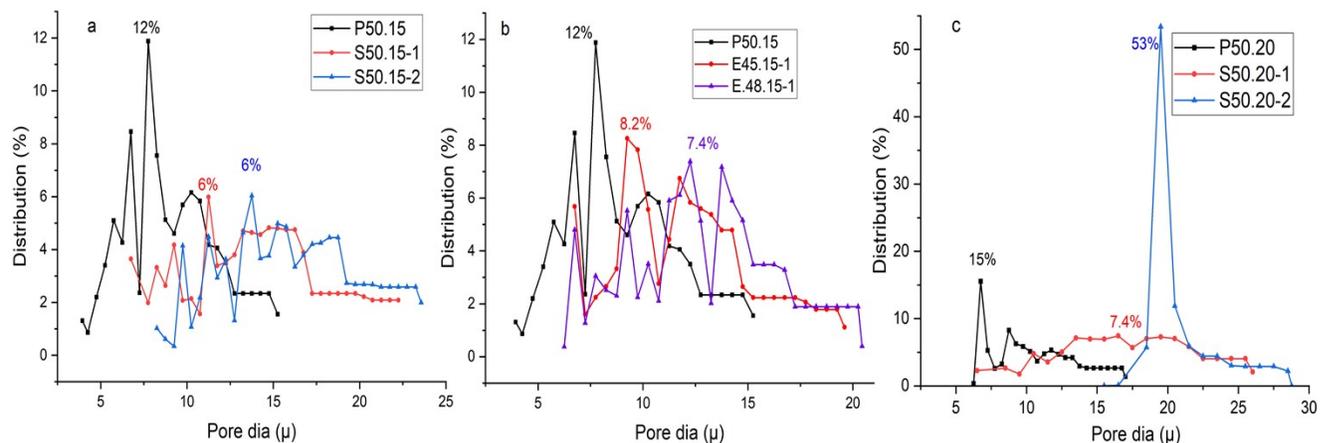**SUPPLEMENTAL INFORMATION**

Fig. S 2. Pore size distribution of meltblown webs produced with and without MgSt.
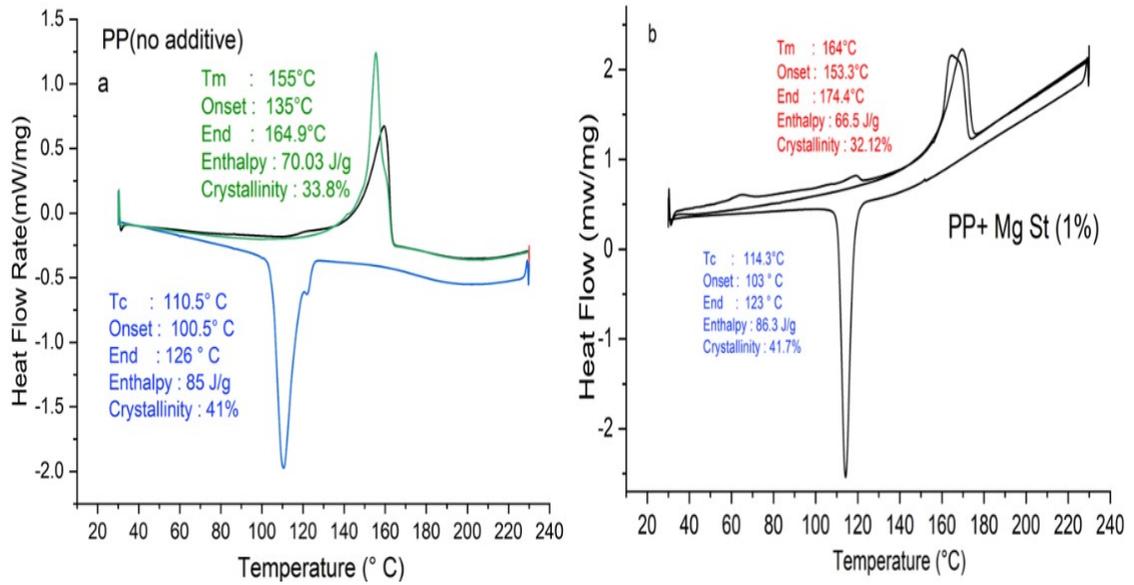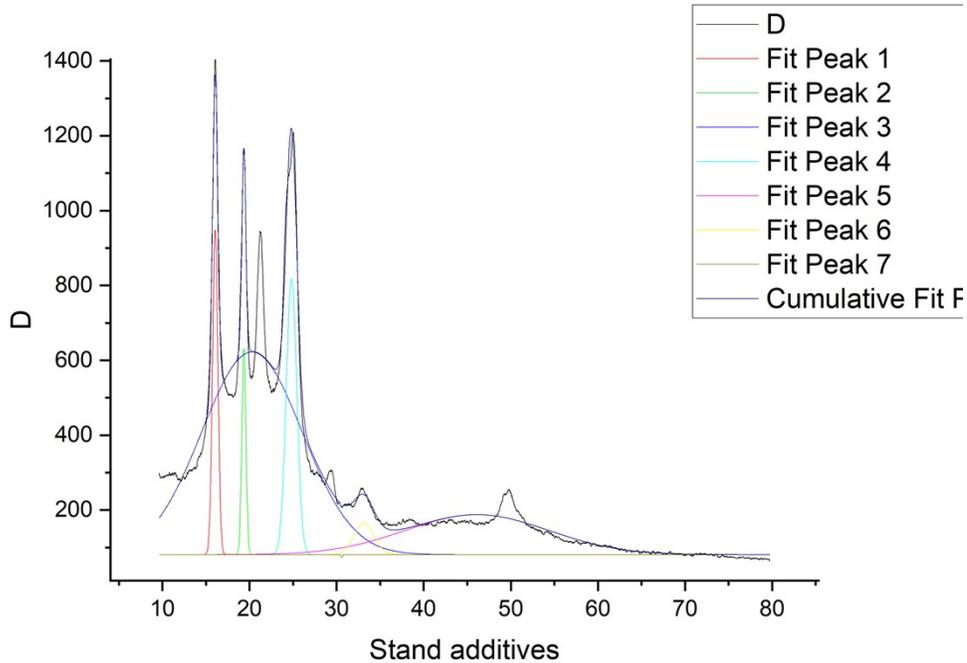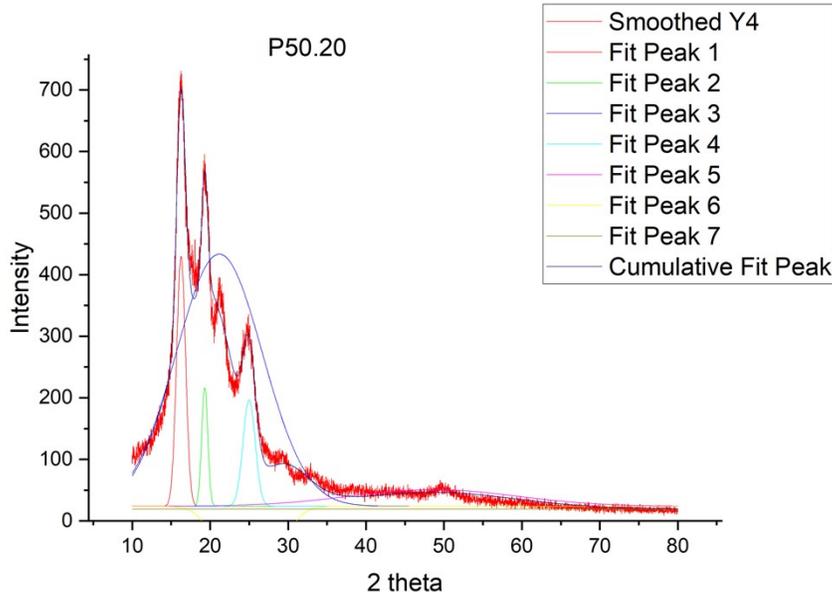
Fig. S 2.Differential scanning calorimetry traces of melt-blown nonwovens a) PP (no additives) b) 1% MgSt (Heating and cooling rate 10°C /min).

S3. Calculation of crystallite size (Using Origin Pro)

	y0		xc		w		A		sigma		FWHM	
	Value	Standard Error		Standard Error	Value	Standard Error	Value	Standard Error	Value	Standard Error	Value	Standard Error
Peak1(D)	80.62029	1.16362	16.06207	0.00276	0.61574	0.00578	673.71051	5.95231	0.30787	0.00289	0.72497	0.00681
Peak2(D)	80.62029	1.16362	19.34873	0.00379	0.46838	0.00793	325.7428	5.17825	0.23419	0.00396	0.55148	0.00933
Peak3(D)	80.62029	1.16362	20.28081	0.02775	11.53329	0.05425	7832.4901	39.75862	5.76665	0.02713	13.57941	0.06388
Peak4(D)	80.62029	1.16362	24.81922	0.00462	1.20677	0.01016	1116.11727	9.65335	0.60339	0.00508	1.42087	0.01196
Peak5(D)	80.62029	1.16362	46.10439	0.1445	16.51661	0.38822	2212.39394	59.53033	8.25831	0.19411	19.44683	0.45709
Peak6(D)	80.62029	1.16362	33.15451	0.05702	2.28947	0.12755	243.39816	14.21532	1.14473	0.06377	2.69564	0.15017
Peak7(D)	80.62029	1.16362	30.57822	0.17452	0.20153	0.35607	-1.99828	3.17816	0.10076	0.17803	0.23728	0.41923

P50.20

Legend: Smoothed Y4, Fit Peak 1, Fit Peak 2, Fit Peak 3, Fit Peak 4, Fit Peak 5, Fit Peak 6, Fit Peak 7, Cumulative Fit Peak

	y0		xc		w		A		sigma		FWHM	
	Value	Standard Error	Value	Standard Error	Value	Standard Error	Value	Standard Error	Value	Standard Error	Value	Standard Error
Peak1(Smoothed Y4)	23.63801	56858.03589	16.26853	0.00299	1.14858	0.0073	585.44351	4.56769	0.57429	0.00365	1.35234	0.0086
Peak2(Smoothed Y4)	23.63801	56858.03589	19.30307	0.005	0.78315	0.01225	188.97398	3.51564	0.39157	0.00613	0.92209	0.01443
Peak3(Smoothed Y4)	23.63801	56858.03589	21.17025	0.08074	11.0877	0.17162	5694.52885	227.95608	5.54385	0.08581	13.05477	0.20207
Peak4(Smoothed Y4)	23.63801	56858.03589	24.99928	0.0087	1.56863	0.02672	340.15416	10.02337	0.78432	0.01336	1.84692	0.03146
Peak5(Smoothed Y4)	23.63801	56858.03589	48.6388	1.1141	21.46867	4.26233	728.20795	620.22799	10.73433	2.13116	25.27742	5.01851
Peak6(Smoothed Y4)	23.63801	56858.03589	24.99928	0.04372	5.78479	0.12779	-1563.04534	76.60788	2.8924	0.06389	6.81107	0.15046
Peak7(Smoothed Y4)	23.63801	56858.03589	48.6388	733.15057	265.78814	1686847.31559	-1532.85612	2.86631E7	132.89407	843423.65779	312.94162	1986110.94106

S4. Statistical Analysis

To determine whether corona charging significantly improved the Quality Factor (QF), a paired t-test was conducted using matched before–after measurements from each sample (n = 3).

The hypotheses were:
H₀: There is no difference in mean QF before and after charging ($\mu\_before = \mu\_after$).
H₁: Charging increases QF ($\mu\_after > \mu\_before$).

The paired t-statistics were calculated as:

$$t = \frac{\bar{d}}{s_d/\sqrt{n}}$$

where $\bar{d}$ is the mean of the paired differences and s_d is their standard deviation.

The analysis yielded **t = 9.47** with **p = 0.011**, indicating a statistically significant improvement in QF after charging at the 95% confidence level.