

Supporting Information

TiO₂ coated meltblown nonwoven fabrics prepared via Atomic Layer

Deposition for photocatalytic water treatment

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Characterization of meltblown nonwoven fabric properties:

The basis weight of the fabric samples used in this study was measured according to the ASTM D3776 Standard Test Methods for Mass Per Unit Area (Weight) of Fabric. The weight of 5 sample replicates, each with a 100 cm² area, was measured for each sample. The thickness was measured according to the ASTM D1777 Standard Test Method for Thickness of Textile Materials by an automated thickness gauge (Hanatek Instruments). Ten replicates were tested for each sample used in this experiment.

The fabric solidity (fiber volume fraction), S_f , was used to evaluate the structure compactness of the samples with porous structure. It was calculated according to the following Equation (S1):

$$S_f = \frac{m}{H \cdot \rho} \times 100(\%) \quad (S1)$$

where m is the sample weight, H is the sample thickness, and ρ is the density of PP (0.91 g/cm³).

A Capillary flow porometer (CFP-1100-Ax, Porous Materials Inc., U.S.) was used to measure the mean flow pore diameter and pore diameter distribution. Three replicates of each sample with a measurement area of 5.1 cm² were carried out. Galwick solution with a surface tension of 15.9 dynes/cm and tortuosity factor of 0.715 was used.

The fiber diameters of meltblown nonwoven fabrics were measured based on scanning electronic microscope (SEM) images. Meltblown fabrics were sputter-coated with a thin layer of gold/palladium and 10 images per each meltblown samples were taken with an SEM microscope (Phenom FEI) and a total of ~100 fiber diameter measurements per sample were conducted using Image J software from the images.

Table S1. Processing conditions of meltblown nonwoven fabrics production.

Sample ID	Processing Air volume (m ³ /hr)	Throughput (g/hole/min)	DCD (Die to collector distance) (mm)
PPW-7	500	0.9	300
PPW-8	1200	0.9	300
PPW-9	1900	0.9	300

Table S2. Meltblown fabrics structural characteristics. Average and standard deviations of basis weight, thickness, solidity, pore size and fiber diameters are given.

Sample ID	Basis Weight (gsm)	Thickness (μm)	Solidity (%)	Pore size			Fiber Diameter (μm)
				Smallest pore diameter (μm)	Mean flow pore diameter (μm)	Bubble points pore diameter (largest pores) (μm)	
PPW-7	51.40± 1.95	895.4 ± 18.9	6.31± 0.22	N/A*	N/A*	N/A*	8.74 ± 3.02
PPW-8	54.80 ± 1.79	495.4 ± 21.8	12.16 ± 0.80	8.02±0.82	18.96 ± 1.38	47.85 ± 1.53	3.62 ± 1.15
PPW-9	54.00 ± 3.54	523.6 ± 17.7	11.33 ± 0.66	6.60±0.33	15.53 ± 0.14	34.53 ± 0.90	2.52 ± 0.57

*Note: Pore size of PPW-7 fabric are too big to measure with PMI.

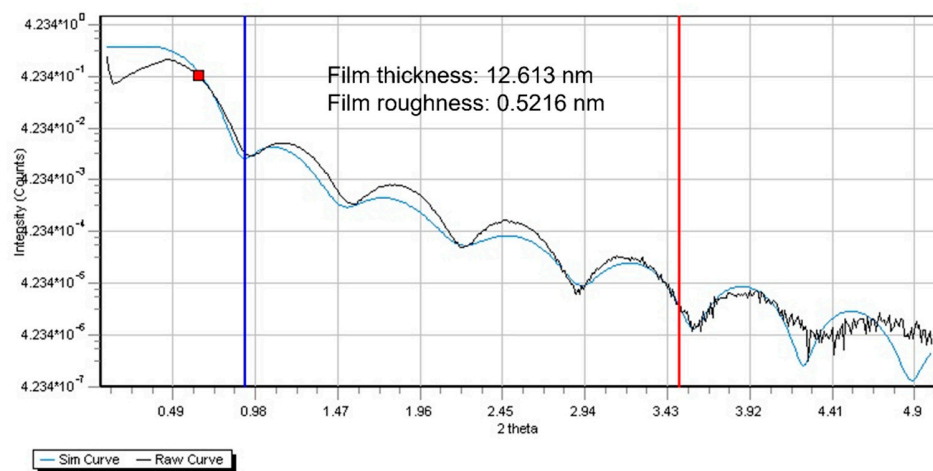


Figure S1: Fitted XRR data for metal oxide ALD film on Si reference.

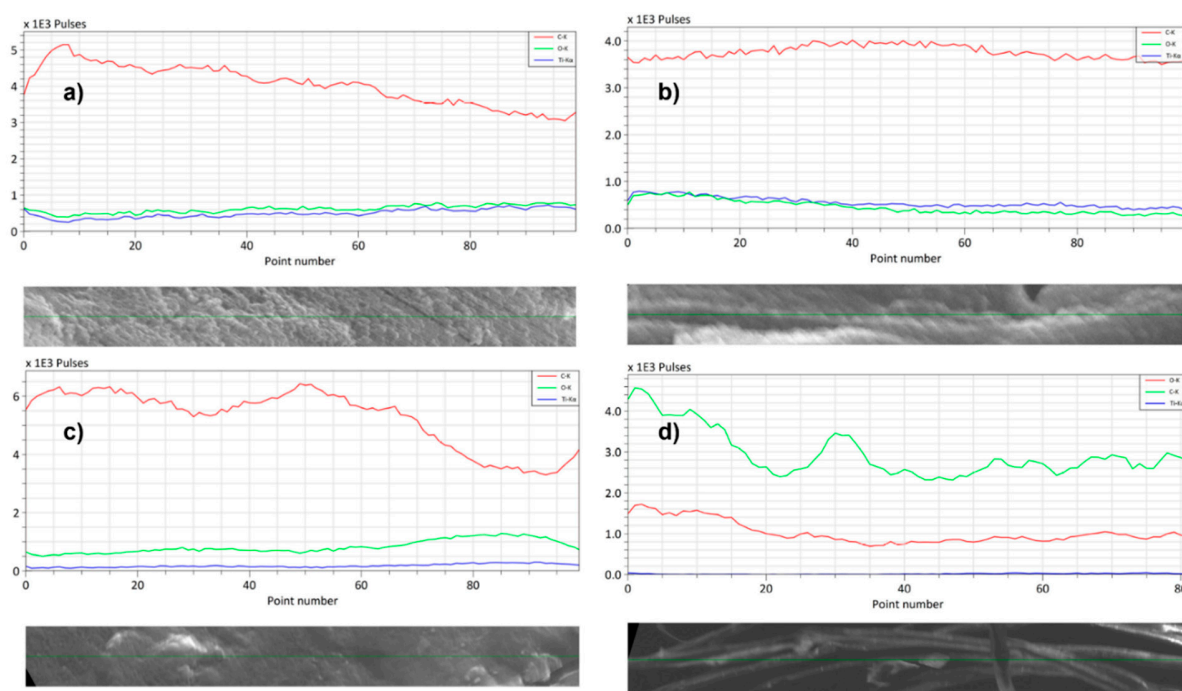


Figure S2: EDS line scan data of TiO_2 coated fabrics. (a) PPW7 (b) PPW8 (c) PPW9 (d) Lapro.

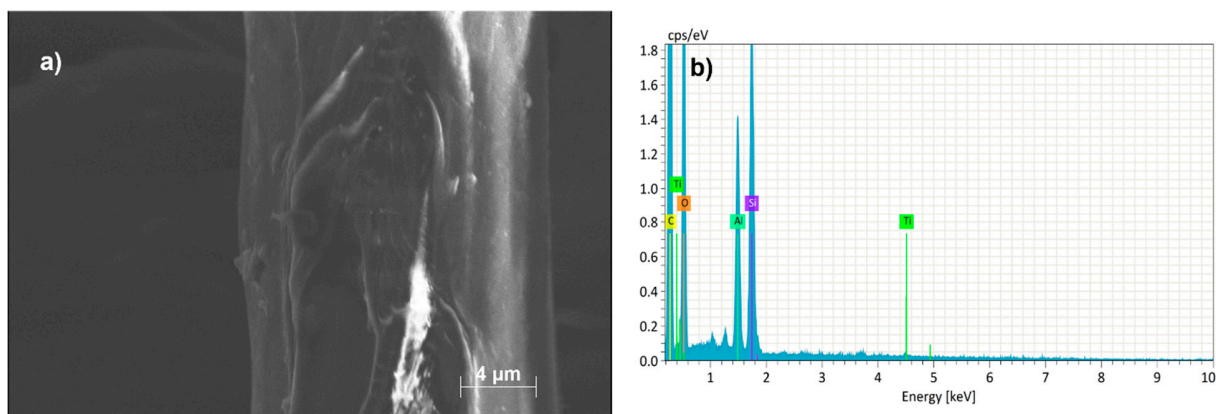


Figure S3: ALD films on commercial textile. (a) SEM image of TiO₂ film (b) EDS spectrum of TiO₂ film.

Table S3: Atomic weight percentages as determined via XPS for TiO₂ coated nonwovens before and after catalysis.

Name	Atomic % (Before Catalysis)	Atomic % (After Catalysis)
Ti 2p	10.21	13.44
C 1s	61.73	47.9
N 1s	0.43	1.91
O 1s	27.63	36.75