Supplementary Information

Exceptional Electromagnetic Shielding Efficiency of Silver Coated Carbon Fiber Fabrics via Roll-to-Roll Spray Coating Process

Janghoon Park[1,†], Xiyu Hu[1,†], Mahsa Torfeh[2], Uzodinma Okoroanyanwu[1], Amir Arbabi[2,], and James J. Watkins[1,*]*

[1]Department of Polymer Science and Engineering, University of Massachusetts Amherst, 120 Governors Drive, Amherst, MA, 01003, USA

[2]Department of Electrical and Computer Engineering, University of Massachusetts Amherst, 151 Holdsworth Way, Amherst, MA, 01003, USA

[*]*Corresponding author:* arbabi@ecs.umass.edu *(A.A.)*

watkins@polysci.umass.edu *(J.J.W.)*

[†]J.P. and X.H. contributed equally to this work.

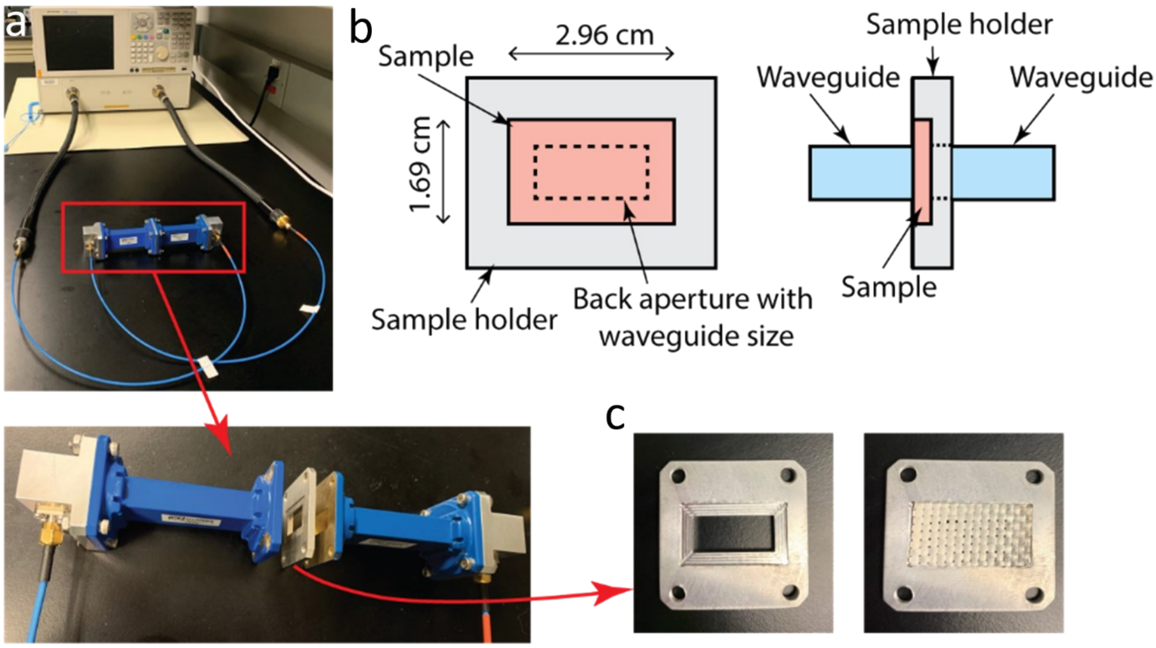

Fig. S1. Measurement setup. (a) The scattering parameters of samples are measured using vector network analyzer. The sample is mounted on a sample holder and is installed between two WR90 waveguides. (b) The schematic of the designed sample holders to cover the gaps at the edges of the sample. (c) The provided sample holders. The thickness of sample holders is determined considering the thickness of the sample.

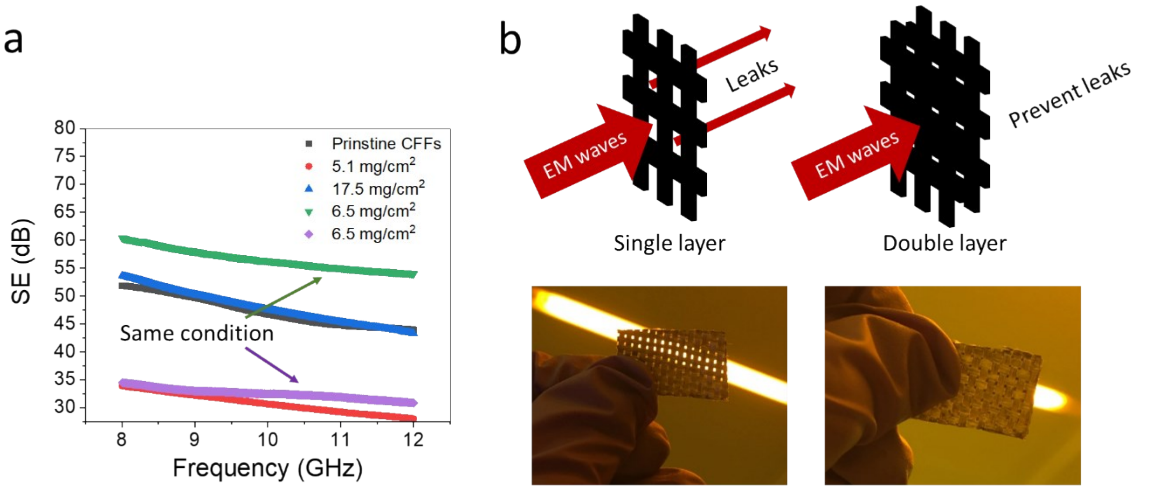

Fig. S2. (a) Results of EMI SE measurements of single-layer composites. SE for two samples prepared under the same condition (6.5 mg/cm^2) shows a difference of 24 dB, (b) EM wave leakage though a single layer due to voids in the CFFs (left), and reducing the leakage by using a double-layer structure (right).

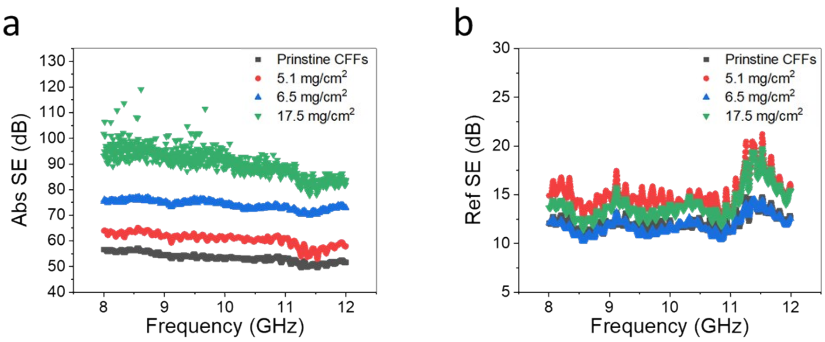

Fig. S3. (a) SE absorption and (b) SE reflection of the Ag-coated CFFs with different coating conditions. Measurement performed on double-layer samples.

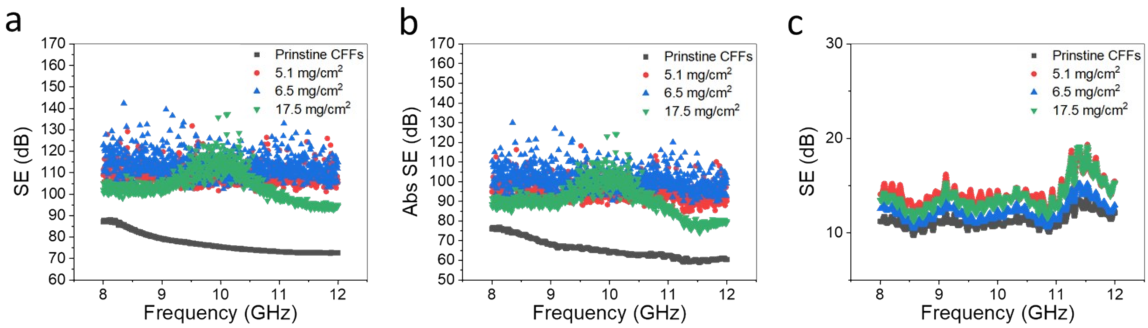

Fig. S4. (a) SE total, (b) SE absorption, and (b) SE reflection of the Ag-coated CFFs with different coating conditions. Measurement performed on triple-layer samples.

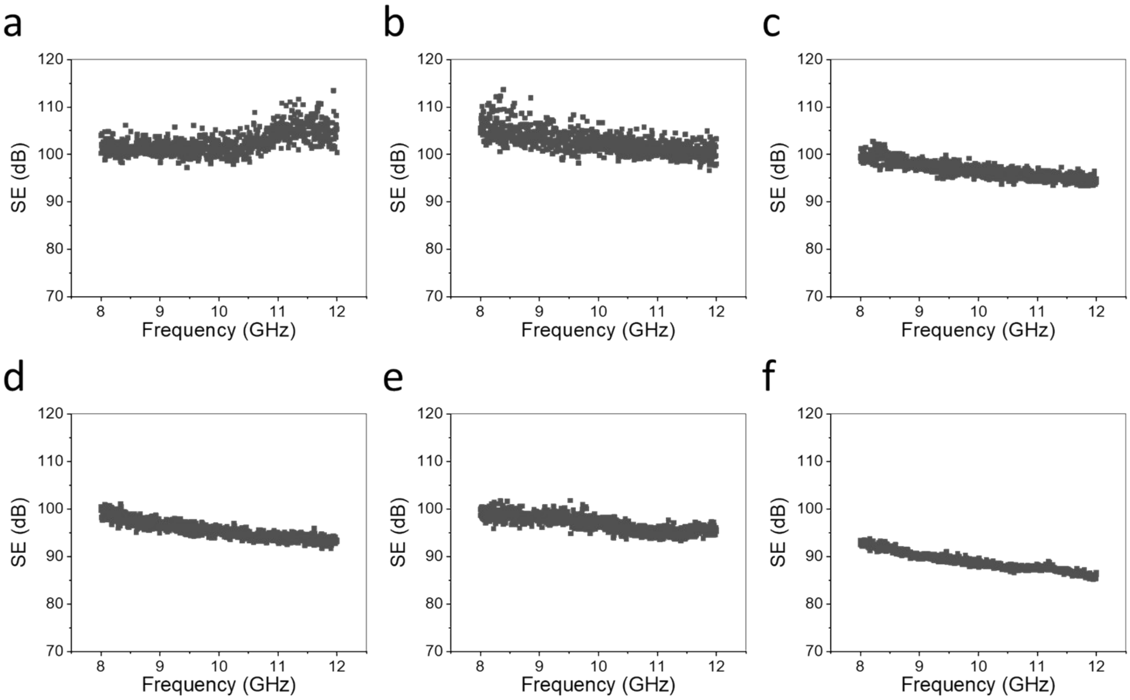

Fig. S5. SE of Ag-coated CFFs composites with different immersion time of (a) 0 day (no immersion), (b) 1 day, (c) 2 days, (d) 3 days, (e) 4 days, and (f) 5 days, in tap water.

Table S1. EMI shielding performance of various shielding materials [*WP*: weight percentage (wt.%), ρ_m: density of shielding material (g/cm^3), *t*: thickness of shielding material (cm), *SE*: shielding effectiveness (dB), *SSE*: specific shielding effectiveness (dB·cm^3/g), *SSE/t*: absolute shielding effectiveness (dB·cm^2/g)]. The table has made based on survey data by Shahzad *et al.*[1]

Type	Filler	*WP*	Matrix	ρ_m	*t*	*SE*	*SSE*	*SSE/t*	Ref.
Carbon	Carbon foam	Bulk	-	0.17	0.2	40	241	1250	2
	CB	15	ABS	0.96	0.11	20	21	190	3
	CB	37.5	EPDM	0.59	0.2	18	30	15	4
Carbon nanotubes	SWCNT	7	PS	0.56	0.12	19	33	275	5
	MWCNT	76.2	WPU	0.04	0.1	21	541	5410	6
	MWCNT	20	PC	1.13	0.21	39	35	164	7
	MWCNT	15	ABS	1.05	0.11	50	48	433	3
	MWCNT	20	PS	0.53	0.2	30	57	285	8
	MWCNT	76.2	WPU	0.13	0.23	51	401	1740	6
	Porous MWCNT	15	PVDF	0.79	0.2	57	72	359	9
	MWCNT	25	Mesocarbon microbeads	0.26	0.06	56	215	3583	10
Reduced GO	RGO	10	PEI	0.29	0.23	13	44	191	11
	RGO	30	PS	0.45	0.2	29	64	258	12
	RGO	16	PI	0.02	0.08	21	937	11712	13
	RGO/Fe_3O_4	10	PEI	0.41	0.25	18	44	176	14
	RGO	7	PS	0.26	0.25	45	173	692	15
	RGO/Fe_3O_4	Bulk	-	0.77	0.03	24	31	1033	16
	RGO	25	PEDOT	1.04	0.08	70	67	841	17
Metals	CuNi	Bulk	-	0.24	0.15	25	104	690	18
	CuNi-CNT	Bulk	-	0.23	0.15	55	237	1580	18
	Ag nanowires	4.5	PI	0.03	0.5	35	1208	2416	19
	SS	1.1 vol.%	PP	0.64	0.31	48	75	242	20
	Copper	Bulk	-	9.00	0.31	90	10	32	21
	SS	Bulk	-	8.09	0.4	89	11	28	21
	Ni fiber	7 vol.%	PES	1.87	0.285	58	31	109	21
	Ni filaments	7 vol.%	PES	1.85	0.285	87	47	165	21
	Al foil	Bulk	-	2.70	0.0008	66	24	30555	1
	Cu foil	Bulk	-	8.97	0.001	70	8	7812	1
	Ni-Co	67	PAN	0.59	0.018	78	131	7325	22
MXenes	$Ti_3C_2T_x$	Bulk	-	2.39	0.0011	68	28	25863	1
	$Ti_3C_2T_x$	90	SA	2.32	0.0008	57	25	30830	1
Others	GO	5	Cellulose	0.06	0.2	58	1026	5131	23
	CNT/GF	2.7 (GF), 2 (CNT)	PDMS	0.09	0.15	75	833	5550	24
	PEDOT:PSS	25	GF	0.08	0.15	92	1206	8040	25
Ag/CFFs (This work)	Ag (on R2R)	17	CFF	0.52	0.046	102	194	4266	-
	Ag	21	CFF	0.76	0.064	104	136	2144	-
	Ag	25	CFF	0.82	0.063	86	105	1671	-
	Ag	48	CFF	0.98	0.075	76	77	1032	-

Note: Acrylonitrile butadiene styrene (ABS), ethylene propylene diene monomer (EPDM), carbon black (CB), single-walled carbon nanotube (SWCNT), multi-walled carbon nanotube (MWCNT), polystyrene (PS), waterborne polyurethane (WPU), polycarbonate (PC), polyvinylidene fluoride (PVDF), reduced graphene oxide (RGO), polyethylenimine (PEI), poly (3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS), polyimide (PI), polypropylene (PP), polyether sulfones (PES), polyacrylonitrile (PAN), sodium alginate (SA), graphene foam (GF), polydimethylsiloxane (PDMS), carbon fiber fabric (CFF), roll-to-roll (R2R).

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