Table S1. Summary of Performance Metrics from Representative Studies on Electrospun SERS Substrates

Method	Serial Number	Fiber	Plasmonic Structures	Preparation Process	Enhancement Factor	Signal Uniformity	Target Molecule/Analyte	Limit of Detection (LOD)	Sampling Methodology	Application Field
Inner/pre-synthesizing	[1]	PVA	aggregated AgNPs	mixing	4.7-9.0 × 10^9	7% (15 positions)	4-mercaptobenzoic acid (4-MBA)	10^{-9} M	liquid	-
	[2]	PVA	AuNR–AgNW nanocomposites	mixing	-	8% (15 positions)	3,3'-diethylthiatricarbocyanine iodide (DTTCI)	10^{-7} M	liquid	-
	[3]	PCL	AgNPs	mixing	-	7.78% (20 μm × 20 μm)	R6G, melamine	5 ppb	liquid	Food Safety
	[4]	PNIPAAm	AgNPs	mixing	-	14.6% (50 points)	adenosine	10^{-7} M	liquid	Biomedical Diagnostics
	[5]	poly(N-isopropylacrylamide-co-N-hydroxymethylacrylamide)	Au@Ag bimetallic nanorods	mixing	-	4.29% (10 points)	4-MBA	10^{-15} M	liquid	-
	[6]	CA	aggregated AgNCs	mixing	3.8 × 10^6 (p-ATP)	10.4% (100 μm × 100 μm)	p-ATP, methyl parathion	10^{-10} M, 10^{-8} M	liquid	Environmental Monitoring
	[7]	PVA	AuNPs	mixing	4 × 10^4 (for MB)	10.1% (10 points)	methylene blue (MB), methyl salicylate (MS)	5 × 10^{-6} M, 10^{-2} M	liquid	Public Security
	[8]	PVA	Au nanoprisms	mixing	10^7 (4-MBA)	< 7.4% (100 positions)	4-MBA, tetramethylthiuram disulfide (TMTD)	10^{-10} M, 10^{-6} M	solid (wiping)	Food Safety
	[9]	PVA	AuNPs	mixing	1.31 × 10^6 (MG) 1.51 × 10^6 (R6G)	10% (1 mm × 1 mm)	malachite green (MG), doxycycline (DCH), enrofloxacin (ENX)	7.32 × 10^{-9} M, 0.2 ppm, 0.3 ppm	solid (extraction)	Food Safety
	[10]	PES	AuNPs	mixing	1.15 × 10^7 (4-MBA)	-	dimethyl phthalate	10^{-8} M	liquid	Environmental Monitoring
Inner/pre-reduction	[11]	PVA	AuNPs	citrate reduction	-	-	4-MBA	10^{-6} M	liquid	-
	[12]	PVA	small AgNPs	UV reduction	1.58 × 10^5	8.81% (20 points)	R6G	10^{-5} M	liquid	-
	[13]	poly(N-isopropylacrylamide-co-N-hydroxymethylacrylamide)	small AgNPs	UV reduction	-	5.8% (20 points)	4-nitrothiophenol	10^{-12} M	liquid	Reaction Monitoring
Inner-surf/post-reduction	[14]	PAN	AgAu or AgPd bimetallic NPs	$NaBH_4$ reduction	-	-	R6G	10^{-11} M	liquid	Reaction Monitoring
	[15]	PMAA/PVP	AgNPs	UV reduction	-	<0.2% (30 points)	malachite green (MG)	2 × 10^{-6} M	liquid	-
	[16]	PAN	small AgNPs	UV reduction	3.1 × 10^5 (p-ATP)	< 11% (15 points)	MG	10^{-7} M	liquid	Environmental Monitoring
	[17]	PAN	AuNPs or AgNPs	plasma etching	4.73 × 10^8	11% (20 points)	R6G	10^{-12} M	liquid	-
	[18]	PVA	AuAg bimetallic NPs	plasma etching	10^8 (R6G)	5% (100 points)	R6G, fluconazole (FLU), lincomycin (LIN)	3.8 × 10^{-9} M, 0.1 ppm, 0.3 ppm	liquid	Biomedical Diagnostics
	[19]	PLA	AgNPs	plasma etching	1.47 × 10^7 (R6G)	8.68% (15 points)	R6G, thiram	10^{-10} M, 10^{-8} M	solid (wiping)	Food Safety
Surf/pre-synthesizing	[20]	thiol-modified PAN	Au nanorods	Au-SH interaction	1.14 × 10^4 (uric acid)	-	uric acid	10^{-7} M	liquid	Biomedical Diagnostics
	[21]	PMMA/P4VP	urchin-like AuNPs	Au-N interaction	1.26 × 10^7	6.6% (20 points)	4-MBA	10^{-6} M	liquid	Biomedical Diagnostics
	[22]	P2VP (aligned)	Au nanorods	Au-N interaction	-	<10% variation (6 points)	1,4-Benzenedithiol (1,4-BDT)	–	liquid	-
	[23]	PVA/PEI	AgNPs	electrostatic interaction	10^7 ~ 10^8 (R6G)	RSD < 14.1% (20 points)	R6G, p-ATP	10^{-10} M, 10^{-8} M	liquid	Biomedical Diagnostics / Wearable
	[24]	PCL (cationic modification)	AuNRs (anionic modification)	electrostatic interaction	10^4-10^5 (4-MPy)	4.57% (7 points)	R6G	10^{-7} M	liquid	-
	[25]	PVA/PEI	AgNPs	electrostatic interaction	1.4 × 10^5 (R6G)	9.5% (7 points)	R6G, enrofloxacin	10^{-6} M, 10^{-5} M	solid (extraction, wiping)	Food Safety
	[26]	PAN (cationic modification)	Ag triangular nanoplate	electrostatic interaction	3.63 × 10^6 (R6G)	19.06% (50 μm × 50 μm)	HBD-2	59.566 fg/mL	solid (skin)	Biomedical Diagnostics / Wearable
	[27]	Amine-Functionalized PAN	Au@Ag NPs	electrostatic interaction	-	-	thiabendazole (soy milk, soy sauce)	23.1 ppb for soy milk, 79.4 ppb for soy sauce	liquid	Food Safety
	[28]	TPU	AgNPs	physical interaction	1.36 × 10^4 (R6G)	-	purines, proteins, lipids, thiram, bacteria	–	solid (food surface)	Food Safety / Bacterial Detection
	[29]	PS (nanopores)	AgNPs	physical interaction	10^7 (R6G)	-	R6G, cyclotrimethylenetrinitramine (RDX), dinitrotoluene (DNT) and carbofuran	10^{-7} M, 10^{-7} M, 10^{-7} M, 10^{-6} M	solid (wiping)	Food Safety / Security
	[30]	Amidoximated PAN	Au Nanostar	physical interaction	-	9% (1 mm × 1 mm)	uranium(VI) oxide	0.3 U/mg polymer	liquid	Environmental Monitoring
	[31]	PVDF/CQDs	Au@Ag nanospheres	liquid-liquid assembly	-	4.16% (10 batches)	carbendazim	1.20 ng/cm^2 on apple peel	solid (wiping)	Food Safety
	[32]	Janus PEI+PAN/TPU	AuNPs	oil-water assembly	-	9.4% (10 points)	R6G	10^{-10} M	liquid (sweat)	Biomedical Diagnostics / Wearable
	[33]	PLA	Au nanoplates	screen printing	-	7.25% (10 points)	respiratory tract virus	10 TU/mL	liquid	Microbiological Detection (Virus)
	[34]	Gluten/zein	AgNPs	electrospraying	2.6357 × 10^8 (p-ATP)	8.93% (50 mm × 50 μm)	nitrite	2.216 × 10^{-12} M	liquid	Food Safety
	[35]	amidoxime PAN	AgNPs	Pd seed/Tollens Test	4.8 × 10^5 (4-MBA)	10% (20 μm × 20 μm)	R6G	10 ppb	liquid	-

Surf/post-modification (in-situ chemical growth)	[36]	PAN	AgNPs	Tollens Test	-	7.1% (E. coli), 8.5% (S. aureus)	4-MBA, E. coli, S. aureus	10^{-9} M, –, –	liquid	Microbiological Detection (Bacteria)
	[37]	PCL	AgNPs + AuNPs	plasma modification/Pd seed/Tollens Test	-	-	prostate specific antigen (PSA)	1 pg/mL	liquid	Biomedical Diagnostics
	[38]	PCL	AgNPs	plasma modification/Pd seed/Tollens Test	-	-	fibronectin from humans (FN), human alkaline phosphatase (ALP)	10 pg/mL	liquid	Biomedical Diagnostics
	[39]	Chitosan/PEO	Ag nanoplates	Tollens Test	1.41×10^6 (2-naphthylthiol)	-	thiram	10^{-11} M	liquid	Food Safety
	[40]	Piezoelectric PVDF	AgNPs	Tollens Test	1.05×10^8	-	thiram	-	solid (wiping)	Food Safety
	[41]	PVDF/CQDs	dense AuNPs	electrostatic interactionc/in-situ growth	1.74×10^7 (MG)	10.6% (20 points)	thiram, bacteria	10^{-10} M	solid/liquid	Environmental Monitoring / Microbiological Detection
	[42]	polyesteramides	AuNPs	electrostatic interactionc/in-situ growth	5.0×10^6 (biphenyl-4-thiol)	< 15% (10 μm × 10 μm)	miRNA-223-3p	1.95×10^{-14} M	liquid	Biomedical Diagnostics
	[43]	oriented alginate	AgNPs	ion exchange/in-situ growth	6.64×10^7 (R6G)	-	R6G	10^{-12} M	solid (wiping)	Environmental Monitoring
	[44]	polyimide	continuous AgNP coating	ion exchange/in-situ growth	1.17×10^7 (p-ATP)	7.47-10.82% (50 points)	2,4-dichlorophenoxyacetic acid	10^{-10} M	liquid/solid	Environmental Monitoring
	[45]	twisted PVDF	compact AgNPs	Au seed/in-situ growth	-	0.082	thiram	10^{-10} M	wearable (skin)	Biomedical Diagnostics / Wearable
	[46]	WO3/PAN	Ag nanocubes	in-situ growth	2.9×10^5 (R6G)	5.5-7.5% (8 batches)	MG, benzaldehyde	10^{-9} M, 100 ppb	gas	Environmental Monitoring
	[47]	PA-66	Ag@ZIF-8 NPs	in-situ growth	-	5.9% (30 points)	dithiohydroquinone	6.64×10^{-8} M	gas	Environmental Monitoring
	[48]	polyamide	vertical Ag-nanosheets	Au seed/electrodeposition	2.2×10^7 (4-MBA)	<15% (500 nm × 500 nm)	PCB-3	10^{-6} M	solid (wiping)	Environmental Monitoring
	[49]	PAN	MIL-100 (Fe) fibers	hydrothermal synthesis	-	9–11% (5 points)	toluene, benzaldehyde	0.092 ppm, 0.12 ppm	gas	Environmental Monitoring
Surf/post-modification (physical vapor deposition)	[50]	TPU	Au layer	sputtering	-	-	sweat pH	pH 4.0–7.0, ~0.51 pH resolution	liquid (sweat)	Biomedical Diagnostics / Wearable
	[51]	TPU	Au layer	sputtering	-	-	cellular pH	pH 5–8	liquid (cellular)	Biomedical Diagnostics
	[52]	PAN	Ag nanoclusters	sputtering	3.2×10^6 (crystal violet)	10% (3 × 3 mm²)	cocaine	10^{-14} M	liquid (blood)	Public Security
	[53]	PU	Ag layer	vacuum evaporation	-	4.78% (30 points)	1,2-bis(4-pyridyl)ethylene (BPE), aflatoxin	10^{-7} M, 10^{-10} M	liquid/solid	Food Safety
	[54]	PU/PEA	ultrathin Ag layer	vacuum evaporation/heat treatment	-	8.196% (20 points)	BPE, sulfamethoxazole	10^{-12} M, 10^{-10} M	liquid	Environmental Monitoring
	[55]	crosslinked PVA	Au layer	vacuum evaporation	1.48×10^6	5–8% (30 points)	malachite green	10^{-8} M	liquid/solid	Environmental Monitoring / Food Safety
	[56]	piezoelectric PVDF	AuNPs	thermal evaporation	9.4×10^7 (R6G)	8.4%-9.9% (15 points)	nitrite ions	10^{-8} M	liquid	Food Safety
Ceramic-based fibers	[57]	CoFe2O4-Ag nanotubes	Ag	calcination	-	-	p-ATP, methylene blue	10^{-9} M	liquid	Photocatalytic Degradation
	[58]	porous CuO–Ag nanofibers	Ag	calcination	-	9.0% (18 points)	azobenzene	10^{-8} g/mL	liquid	Environmental Monitoring
	[59]	mesoporous Ta-doped TiO2 Nanofibers	-	calcination	-	-	methylene blue	–	liquid	Photocatalytic Degradation
	[60]	ZnO	Ag foil	calcination	1.2×10^8 (p-ATP)	-	p-ATP, methylene blue	10^{-12} M	liquid	Photocatalytic Degradation
	[61]	TiO2	Au nanograins	coaxial electrospinning/calcination	5.96×10^{12}	-	furazolidone	3.94×10^{-13} M	liquid	Environmental Monitoring / Food Safety
	[62]	SiO2	AuNPs	calcination/in-situ growth	10^8 (4-MBA)	6.1% (20 points)	thiram, S. aureus	10^{-8} M, 10^3 CFU/mL	liquid	Microbiological Detection
	[63]	SiO2	AgNPs	calcination/in-situ growth	-	7.7% (20 points)	4-MBA, E. coli, S. aureus	10^{-11} M	liquid	Microbiological Detection
	[64]	TiO2 Nanofelt	AgNPs	calcination/in-situ growth	5.62×10^6 (4-MBA)	-	4-MBA	15 ppb	liquid	Catalytic Degradation
	[65]	TiO2 Nanofelt	AgNPs	calcination/in-situ growth	-	-	4-MBA, E. coli, S. aureus	10^{-9} M	liquid	Microbiological Detection
	[66]	TiO2	AgNPs	calcination/in-situ growth	10^9 (R6G)	-	R6G, imidacloprid	10^{-14} M, 10^{-8} M	liquid	Environmental Monitoring / Food Safety
	[67]	TiO2	Ag/AgBr NPs	calcination/in-situ growth	-	-	RhB, Cr(VI)	–	liquid	Photocatalytic Degradation
	[68]	0	Concave Au nanorods	calcination/electrostatic interaction	9.40×10^7 (4-MBA)	3.65% (5 batches) 5.62% (30 points)	asomate	8.19×10^{-9} M	solid (wiping)	Food Safety
Metal-based fibers	[69]	-	Ag Nanotrough Networks	thermal evaporation/dissolution	-	19.6% (9 points)	bacteria (E. coli strains)	–	liquid	-
	[70]	-	mesoporous Au nanotube networks	sputtering/dissolution/replacement reaction	-	4.63-8.11% (9 points)	R6G	10^{-13} M	liquid	-
	[71]	-	Au nanotube networks	sputtering/dissolution	2×10^5 (R6G)	-	R6G, MG	10^{-12} M	solid (wiping)	Environmental Monitoring / Food Safety
	[72]	-	nanoporous Cu/Cu-Ni tubes	electrodeposition/dissolution	-	-	crystal violet	10^{-8} M	liquid	-

Carbon fibers	[73]	CNFs	Ni@Ag NPs	calcination/in-situ growth	1.63×10^7 (R6G)	-	R6G, salivary imidazole	10^{-12} M, 2×10^{-4} M	liquid (saliva)	Biomedical Diagnostics
	[74]	BiFeO3/CNFs	AgNWs	calcination/spin-coating	8.3×10^9	4.08% (9 points)	methylene blue	10^{-13} M	liquid	Reaction Monitoring
	[75]	Fe-N-doped CNFs	-	Fe doping/calcination	3.8×10^4 (R6G)	-	R6G	10^{-7} M	liquid	-
	[74]	amine-functionalized CNFs	AuNPs	calcination/electrostatic interaction	-	-	rhodamine 110	10^{-6} M	liquid	-
	[75]	CNFs	Ag nanoisland	calcination/in-situ growth	16.3×10^7 (R6G)	-	R6G, nitrite	10^{-11} M, 10^{-10} M	liquid (saliva)	Biomedical Diagnostics

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