Supporting information

Biosafety, Self-Adhesive, Recyclable, Tough, and Conductive Hydrogels for Multifunctional Sensor

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Table S1 Hydrogel samples of different components and concentrations.

Samples	Concentration of SA-DOPA (wt.%)	Concentration of Borax (wt.%)	Concentration of PVA (wt.%)	Concentration of AgNW (wt.%)	Concentration of SA (wt.%)
1	0	0.22	11	0.11	0
2	0.22	0.22	11	0.11	0
3	0.33	0.22	11	0.11	0
4	0.33	0.33	11	0.11	0
5	0.33	0.44	11	0.11	0
6	0.22	0.33	11	0.11	0
7	0.22	0.44	11	0.11	0

8	0	0.44	11	0.11	0.33

Table S2 Estimated toughness, adhesion, elongation at break, and tensile stress strength of various conductive hydrogel-based or PDA-based strain sensors at room temperature.

	Toughness (MJ/m^3)	Adhesion	Elongation at break (%)	Tensile stress (MPa)	Ref.
This work	55.3	YES	500	0.289	--
PVA-CNF	5.25	NO	660	2.1	Ref.[1]
TA-PVA	395.2	NO	404	104.2	Ref.[2]
Cellulose/PVA	--	NO	737	0.0374	Ref.[3]
PVA/PEI	--	NO	500	0.6	Ref.[4]
PDA-clay-PSBMA	--	YES	900	0.09	Ref.[5]
DNA/DEX-g-DOPA	Very weak	YES	Too soft	Too soft	Ref.[6]
PVA-PDA	Very weak	YES	400	$<0.6\times10^{-3}$	Ref.[7]
PVA-FSWCNT-PDA	Too soft	YES	Too soft	Too soft	Ref.[8]
PDA−talc−PAM	Very weak	YES	1500	25×10^{-3}	Ref.[9]
OHGel	---	NO	1700	0.197	Ref.[10]
Hydrogel diodes	weak	YES	130	0.05	Ref.[11]

Table S3 The conductivity of the different hydrogels

Samples	Conductivity/$S.m^{-1}$
PB	0.039
$PS_{0.22\%}B$	0.073
$PS_{0.22\%}AB$	0.094
$PS_{0.33\%}AB$	0.238
Recycled-1	0.245

Recycled-2	0.242
Recycled-3	0.237
Recycled-4	0.235

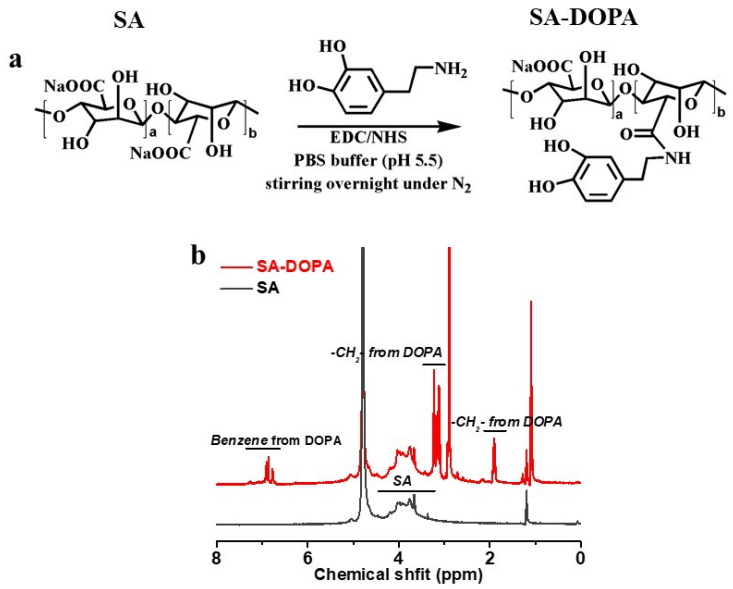

Figure S1 (a) General synthesis of SA–DOPA conjugates via EDC/NHS coupling; (b) ^{1}HNMR spectrum of SA-DOPA and SA.

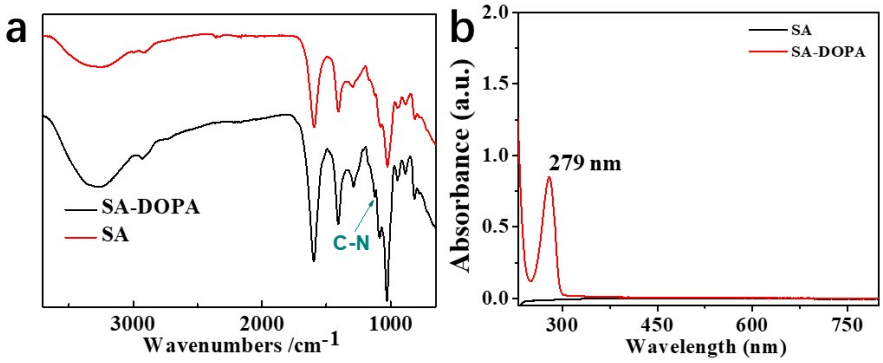

Figure S2 (a) FT-IR spectra of SA-DOPA and SA. The presence of C–N bond at 1120 cm^{-1} indicated that SA-DOPA was successfully synthesized. (b) UV-Vis spectra of SA-DOPA and SA. The strong absorption peak at 279 nm indicated the presence of catechol group, while the normal SA had no significant absorption at 279 nm.

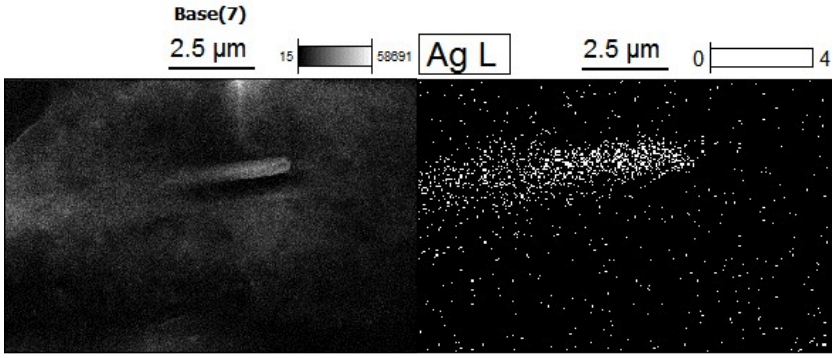

Figure S3 EDS-mapping of Ag in $PS_{0.33\%}AB_{0.44\%}$ hydrogel

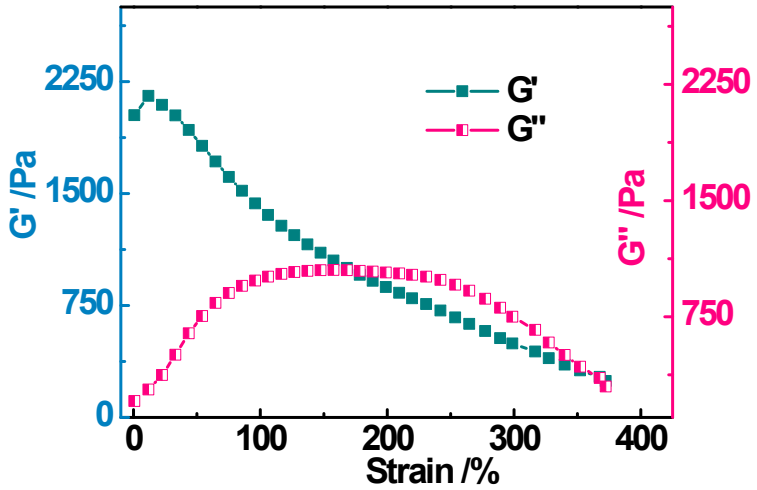

Figure S4 Strain sweep measurement of the PSAB hydrogel at 25 °C (storage modulus G′ and loss modulus G″ as a function of strain γ).

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