Supporting Information

A novel bifunctional transparent non-covalent crosslinked hydrogel for wearable sensor and ions detection

Jun Hu[a], Yuting Tian[a], Xiaoying Xin[a], Michael Daramola[b*] and Guodong Fu[a*]

a School of Chemistry and Chemical Engineering, Southeast University, Nanjing 211189, P. R. China

b Department of Chemical Engineering, University of Pretoria, Pretoria 0002, South Africa

**Corresponding author. E-mail address:* michael.daramola@up.ac.za *and* fu7352@seu.edu.cn

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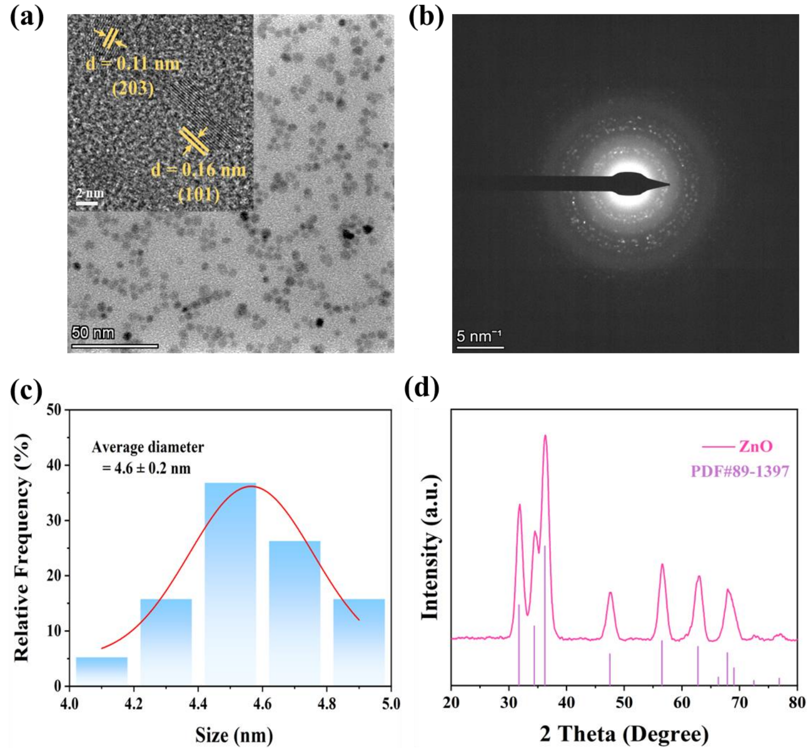

Figure S1. (a) HR-TEM image, (b) Selected area electron diffraction, (c) Size distribution and average diameter, and (d) XRD result of ZnO QDs.

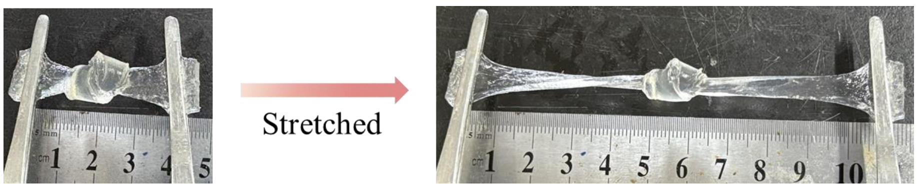

Figure S2. The photograph of $T_{0.3}H_{0.3}$ hydrogel stretched in twisted state.

Figure S3. The picture of $T_{0.3}H_{0.3}$ hydrogel withstood the maximum weight up to 272 g.

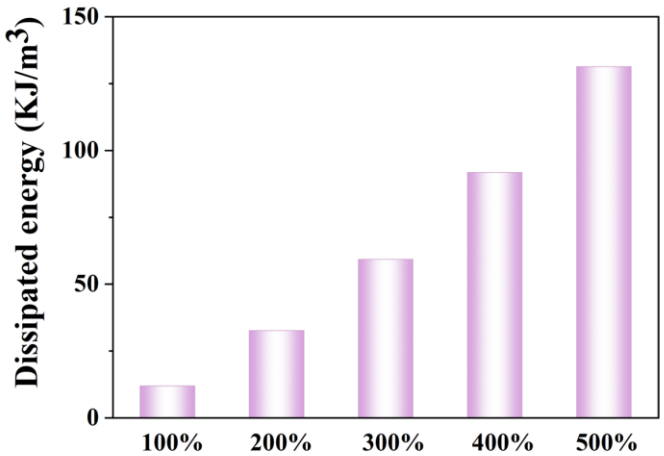

Figure S4. The dissipated energies of $T_{0.3}H_{0.3}$ hydrogel at different stretched strains.

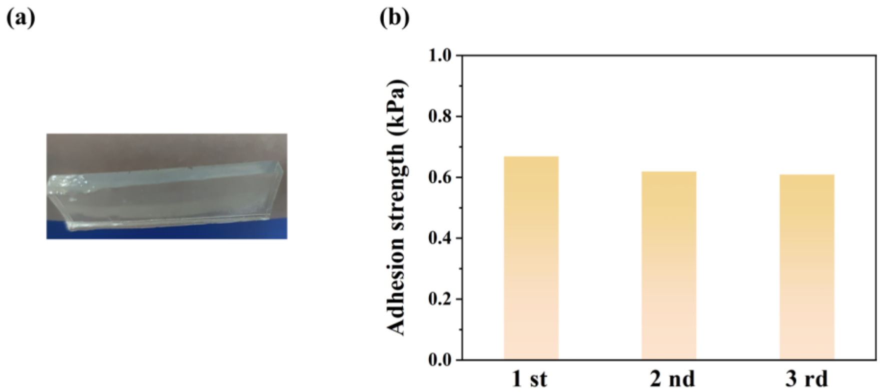

Figure S5. (a) Picture of $T_{0.3}H_{0.3}$ hydrogel adhering to human skin; (b) Adhesion of $T_{0.3}H_{0.3}$ hydrogel to human skin at different adhesion times.

Table S1. The recipe for preparation of SHTP hydrogels.

Entry	SBMA	THMA	HEMA	PVP (M_n = 8000g/mol)	DES	ZnQDs	DI	Time
$T_{0.3}H_{0.1}$	3 g	0.3 g	0.1 mL	0.3 g	1 mL	8 mg	2 mL	10 min
$T_{0.3}H_{0.2}$	3 g	0.3 g	0.2 mL	0.3 g	1 mL	8 mg	2 mL	10 min
$T_{0.3}H_{0.3}$	3 g	0.3 g	0.3 mL	0.3 g	1 mL	8 mg	2 mL	10 min

Table S2 Tensile strength and dissipated energy of $T_{0.3}H_{0.3}$ hydrogel at 500% strain compared to the reported hydrogel.

Sample name	Tensile strength	State of hydrogel at 500% Strain	Dissipated energy	Reference
PSH_{6-4}	40 kPa	fractured	N/A	J. Mater. Chem. A, 2023,11, 9097-9111
Poly(SBMA-*co*-AA)	30 kPa	Intact	N/A	Chem. Eng. J, 2021, 419, 129478
$PAH_{1.0}$-$S_{1.8}$-8	20 kPa	Intact	N/A	Eur. Polym. J, 2023, 186, 111824
S_3	20 kPa	Intact	35 KJ/m^3	ACS Appl. Mater. Interfaces 2024, 16, 10671−10681
PPS-1	180 kPa	Intact	N/A	Composites Part B, 2021, 220, 108984
Alg-SBMA/DI-$\beta G_{0.5\%}$	30 kPa	Intact	N/A	Int. J. Biol. Macromol., 2025, 308, 142495
PSBMA/SA-Ca^{2+} DN hydrogel	-	Fractured	-	J. Mater. Sci. Technol., 2021, 85, 235–244
PS	40 kPa	Intact	N/A	Carbohydr. Polym., 2025, 353, 123257
$T_{0.3}H_{0.3}$	50 kPa	Intact	131.44 KJ/m^3	This work

Note: “N/A” refers to “not available” in the reference, and “-” indicates the data does not exist.

Table S3 Compressive dissipated energy of $T_{0.3}H_{0.3}$ hydrogel compared to the reported hydrogel.

Sample name	**Stress**	**Strain**	**Dissipated energy**	**Reference**
p–DN	250 kPa	60%	200 KJ/m^3	Polymers, 2022, 14, 966
CTPP	50 kPa	60%	12 KJ/m^3	Biomacromolecules, 2025, 26, 1, 679-688
HL-N50	75 kPa	45%	-	Carbohydrate Polymers, 2024, 346, 122642
PPM@C-DES	250 kPa	80%	30 KJ/m^3	Advanced Functional Materials, 2025, 35, 2502844
ionogel-4	160 kPa	70%	25 MJ/m^3	PNAS, 2025, 122, e2417978122
WLSHG	200 kPa	70%	31.11 KJ/m^3	Advanced Functional Materials, 2025, 35, 2501131
$T_{0.3}H_{0.3}$	45 kPa	60%	13 KJ/m^3	This work

Note: “-” indicates the data does not exist.