Electronic Supplementary Information

Hybrid hydrogel system composed of CdTe quantum dots and photonic crystals for optical anti-counterfeiting and information encoding-decoding

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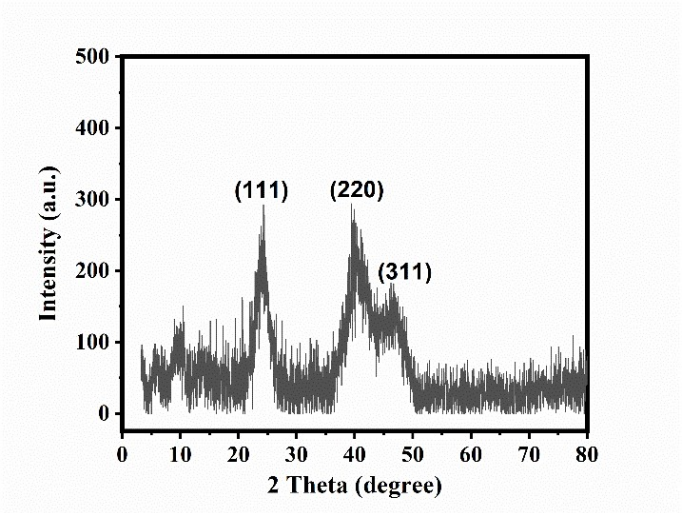

Fig. S1 XRD pattern of CdTe QDs.

Table S1 The particle size, λ_{abs} and PL of CdTe QDs.

Samples	Size (nm)	λ_{abs}(nm)	PL(nm)
CdTe1	2.29	498	554
CdTe2	2.93	527	578
CdTe3	3.32	558	604
CdTe4	3.55	587	624

Table S2 The IQE, I_{abs}, and EQE of CdTe QDs.

Samples	IQE(%)	I_{abs}(%)	EQE(%)
CdTe1	20.39	93.10	19.67
CdTe2	22.71	92.40	21.74
CdTe3	21.90	93.10	21.08
CdTe4	20.70	93.80	20.04

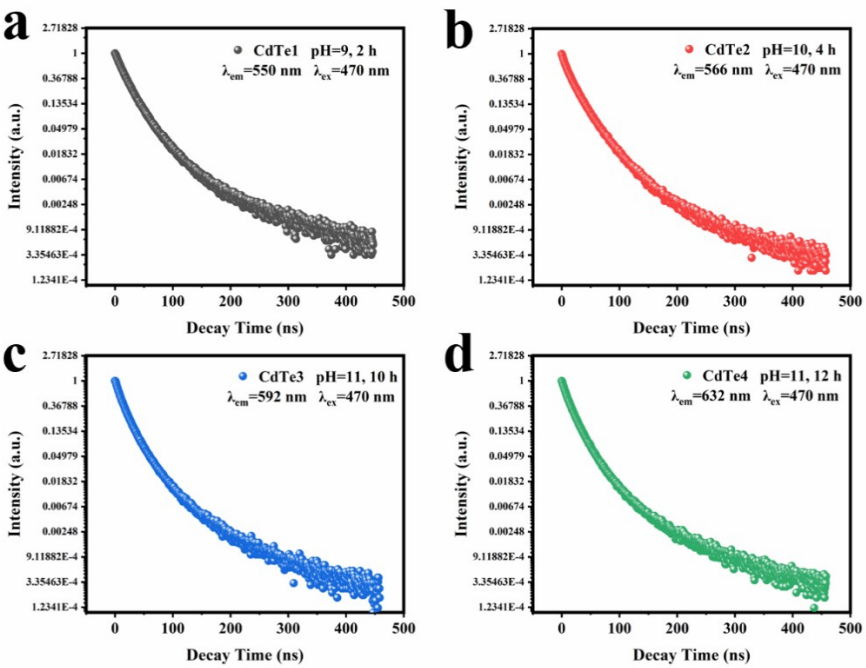

Fig. S2 Fluorescence decay curves corresponding to four different CdTe QDs at normal temperatures.

The fluorescence decay curve of CdTe QDs was fitted and analyzed by using the second-order exponential formula:

$$(t) = A_1\exp(-\tau_1) + A_2\exp(-t\tau_2) + Y_0$$

Where τ_1 and τ_2 are short life and long life, respectively, $\square_1$ and $\square_2$ are pre exponential factors and average life, τ_A is:

$$\tau_A=(A_1\cdot\tau_1^2+A_2\cdot\tau_2^2) / (A_1\cdot\tau_1+A_2\cdot\tau_2)$$

Table S3 The fluorescence lifetime data of CdTe.

Samples	A1	A2	τ_1(ns)	τ_2(ns)	τ_A(ns)
CdTe1	0.6847	0.3141	14.8469	36.7627	26.5034
CdTe2	0.4464	0.5419	8.8358	28.6260	24.6140
CdTe3	0.6382	0.1382	10.2218	28.9705	22.0257
CdTe4	0.6022	0.3957	10.5097	28.6359	22.1401

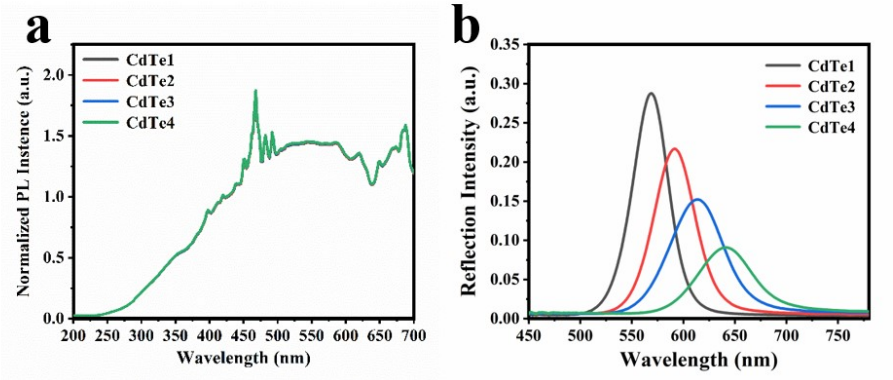

Fig. S3 Fluorescence excitation spectra (a) and reflective peaks (b) of CdTe QDs.

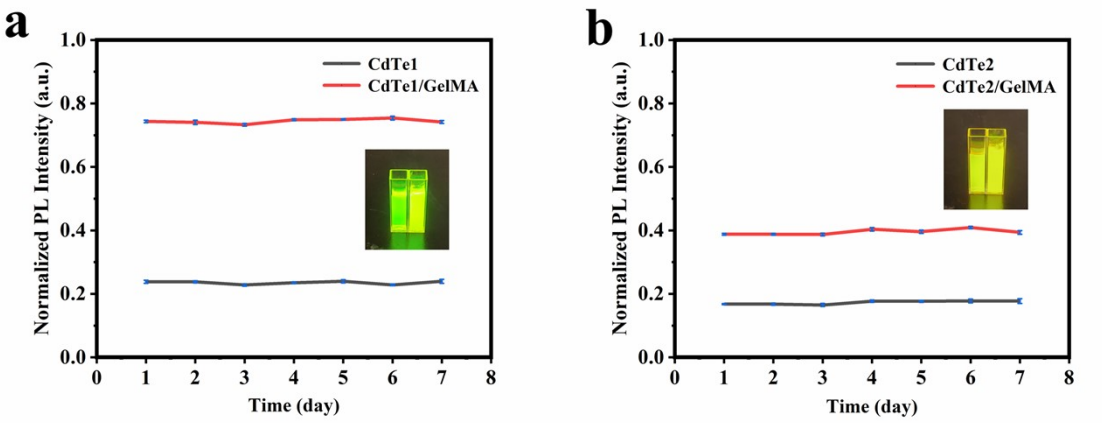

Fig. S4 (a) Fluorescence stability curves of CdTe1 and CdTe1/GelMA; (b) fluorescence stability curves of CdTe2 and CdTe2/GelMA.

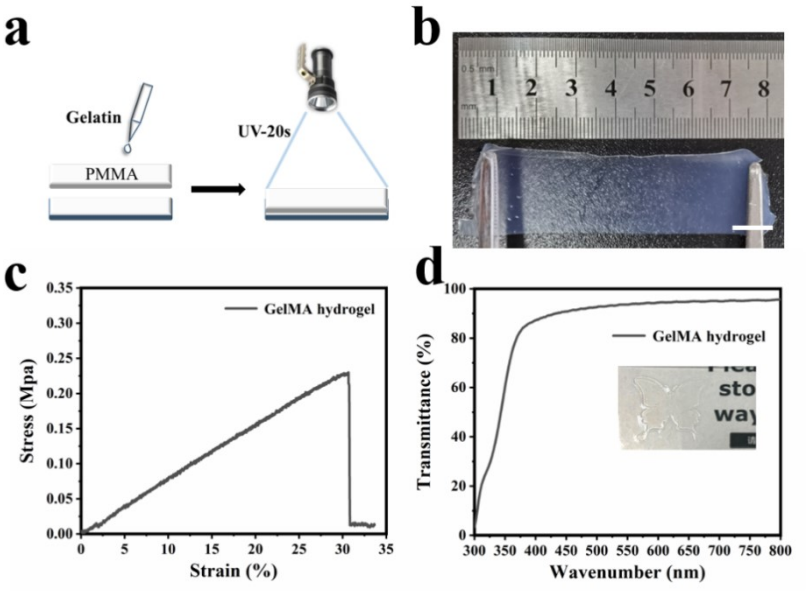

Fig. S5 The properties of GelMA hydrogel. (a) The forming strategy of GelMA hydrogel; (b) photograph of stretching GelMA hydrogel; (c) tensile test of hydrogel block (2 cm × 6 cm). (d) UV-Vis light transmission spectrum of GelMA hydrogel (butterfly" image).

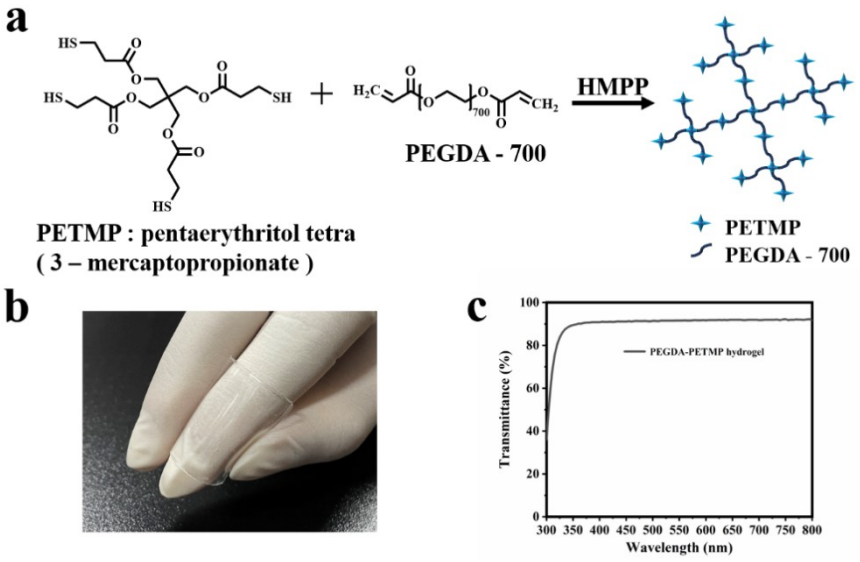

Fig. S6 The formation and performance of PEGDA-PETMP hydrogel. (a) The synthetic route of PEGDA-PETMP hydrogel; (b) photograph of PEGDA-PETMP hydrogel; (c) UV-Vis transmittance spectrum of PEGDA-PETMP hydrogel.

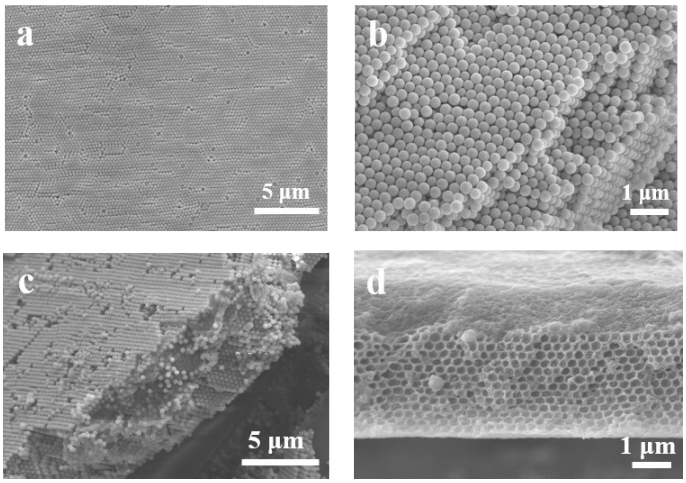

Fig. S7 (a，b) Surface and cross section of SiO_2 PCs; (c) cross section of PEGDA-PETMP + SiO_2 PCs; (d) cross section of PEGDA-PETMP + air PCs.

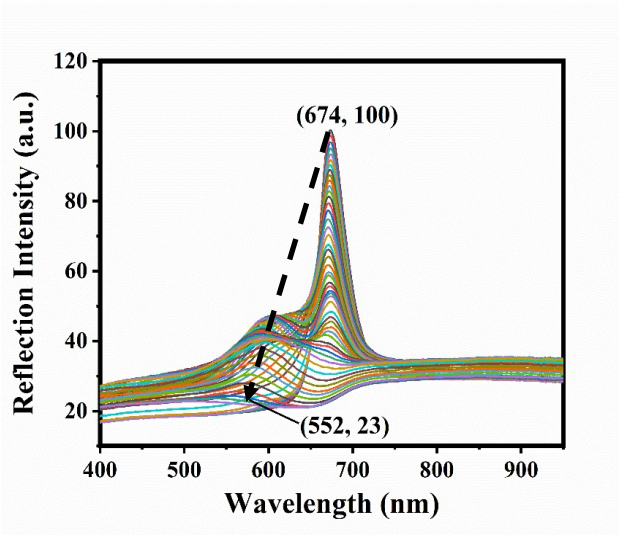

Fig. S8 Reflection spectra of PEGDA-PETMP + air PCs under water loss process.

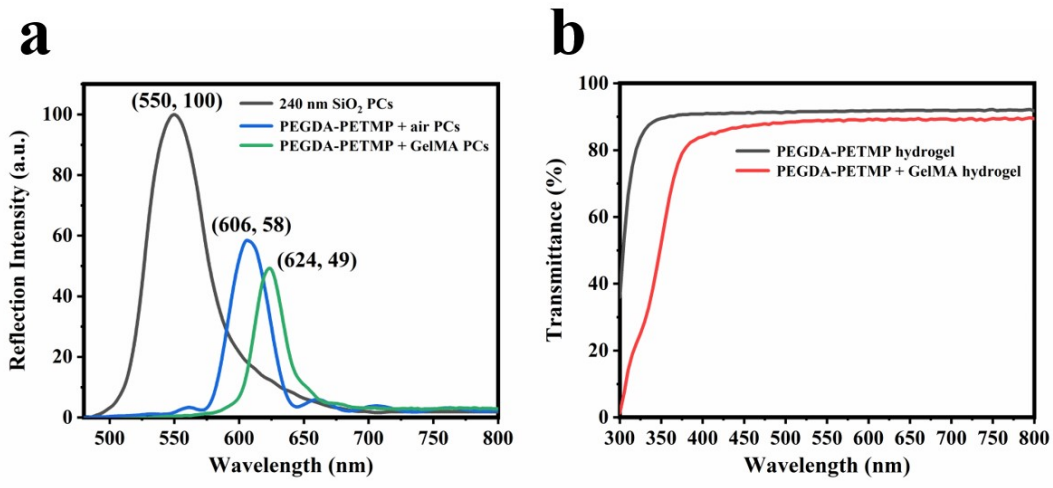

Fig. S9 (a) Reflection spectra of SiO_2 PCs, PEGDA-PETMP + air PCs, PEGDA-PETMP + GelMA PCs, respectively; (b) UV-Vis transmittance spectra of PEGDA-PETMP hydrogel and PEGDA-PETMP + GelMA.

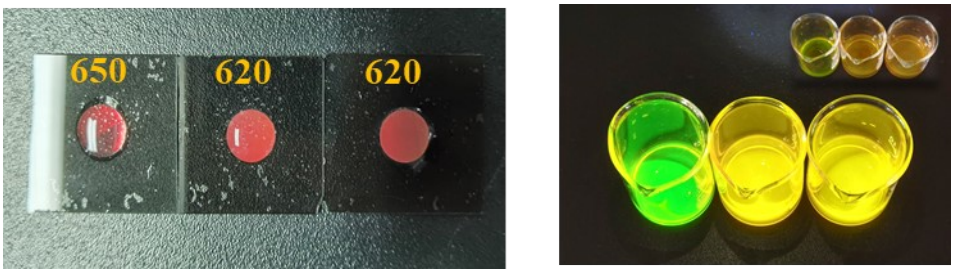

Fig. S10 (a) 650 nm (left) and two 620 nm (middle and right) PEGDA-PETMP + air PCs; (b) CdTe1/GelMA hydrogel, CdTe2/GelMA hydrogel and CdTe1:CdTe4/GelMA hydrogel respectively.

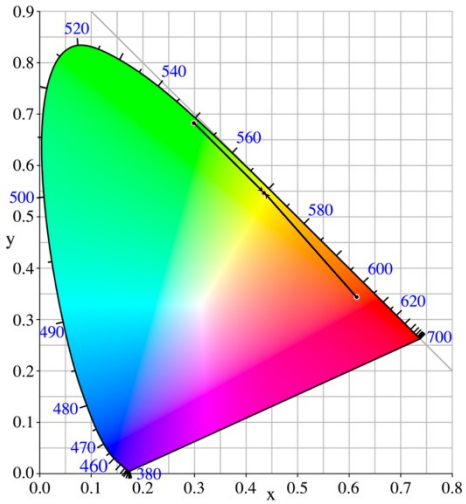

Fig. S11 CIE image of mixed CdTe1 and CdTe4 (concentration ratio was 1:1).