Electronic Supplementary Information

A complicated biocomputing system based on multi-responsive P(NIPAM-*co*-APBA) copolymer film electrodes and electrocatalysis of NADH

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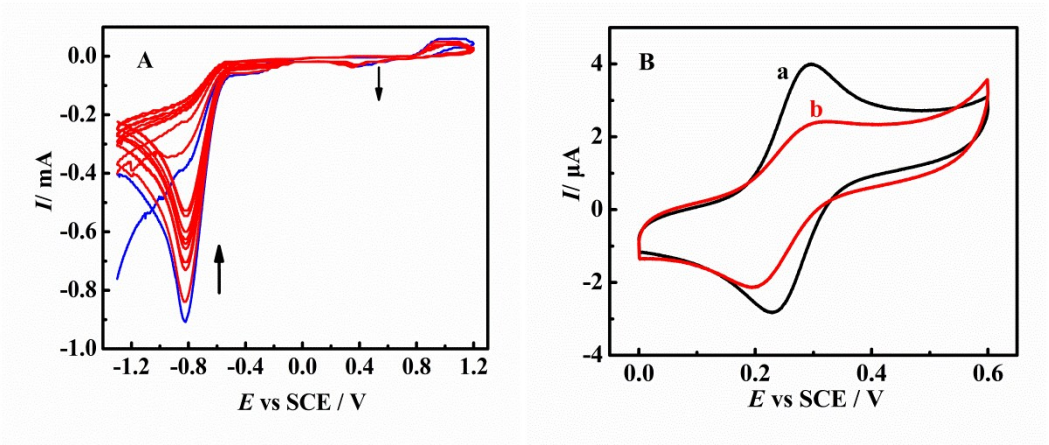

Fig. S1 (A) Continuous CVs at 0.1 V s^{-1} for the electropolymerization of P(NIPAM-*co*-APBA) films at Au electrodes in the precursor solution. (B) CVs of 0.5 mM FCA at 0.1 V s^{-1} in pH 9.0 buffers at 37 °C at (a) bare Au electrodes and (b) P(NIPAM-*co*-APBA) film electrodes.

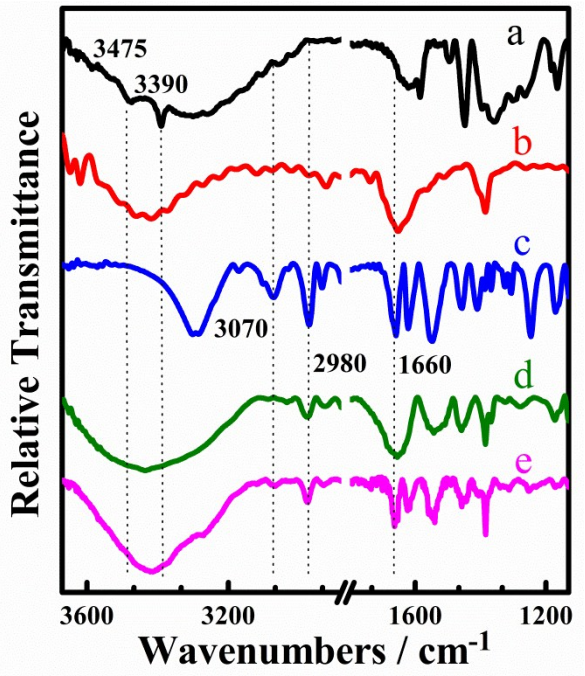

Fig. S2 IR spectra of (a) APBA, (b) PAPBA, (c) NIPAM, (d) PNIPAM and (e) P(NIPAM-*co*-APBA) samples.

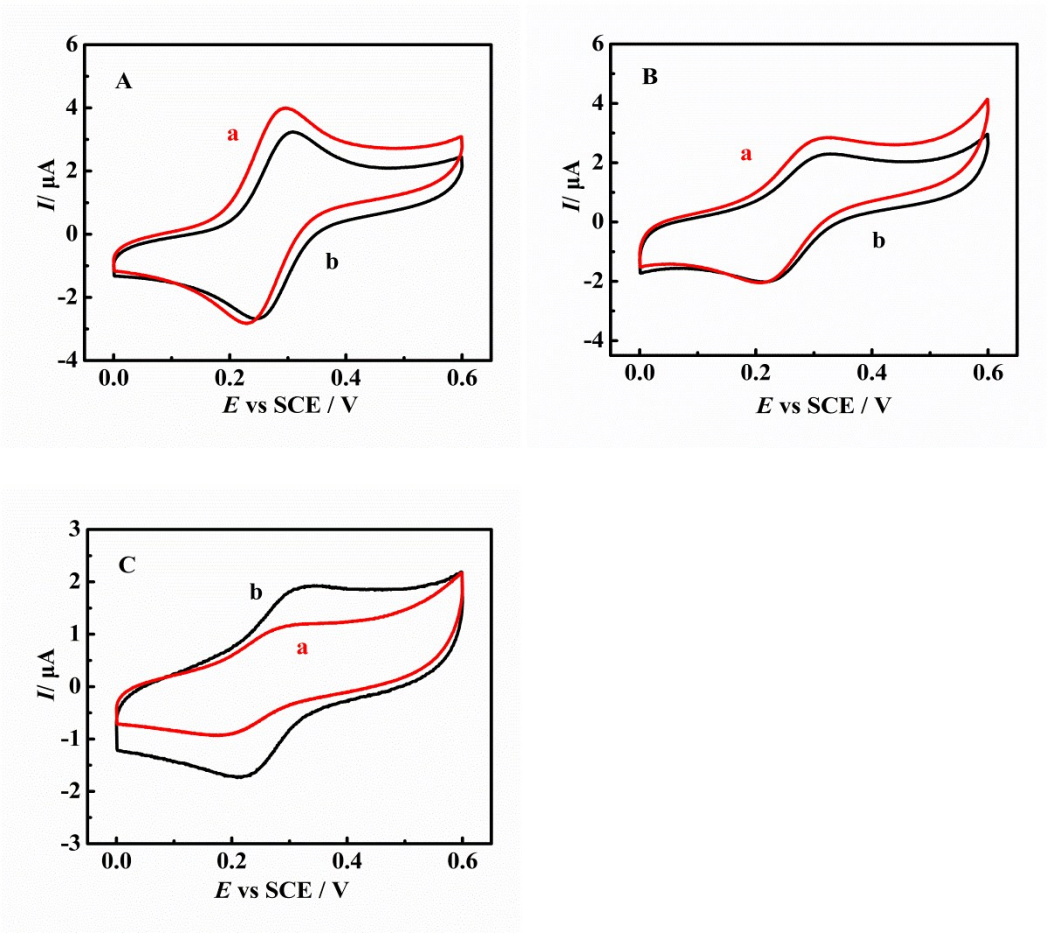

Fig. S3 CVs of 0.5 mM FCA at 0.1 V s^{-1} at (A) bare Au electrodes, (B) PAPBA film electrodes and (C) PNIPAM film electrodes in pH 9.0 buffers at (a) 37 and (b) 20 °C, respectively.

Table 1S Water CA (°) of PNIPAM, PAPBA and P(NIPAM-co-APBA) films electropolymerized on ITO electrodes under different conditions. The CA value was the average of 5 measurements at different positions for the same sample with the standard deviation

	PNIPAM	**PAPBA**	**P(NIPAM-*co*-APBA)**
pH 9.0 at 20 °C	46.8 ± 1.2	52.9 ± 2.6	72.1 ± 1.1
pH 9.0 at 37 °C	98.3 ± 4.9	56.0 ± 2.4	30.6 ± 1.4
pH 9.0 at 37 °C 0.2 M glucose	98.6 ± 4.9	30.6 ± 1.5	29.9 ± 1.0
pH 7.0 at 37 °C	92.2 ± 4.6	65.2 ± 3.3	45.7 ± 2.3

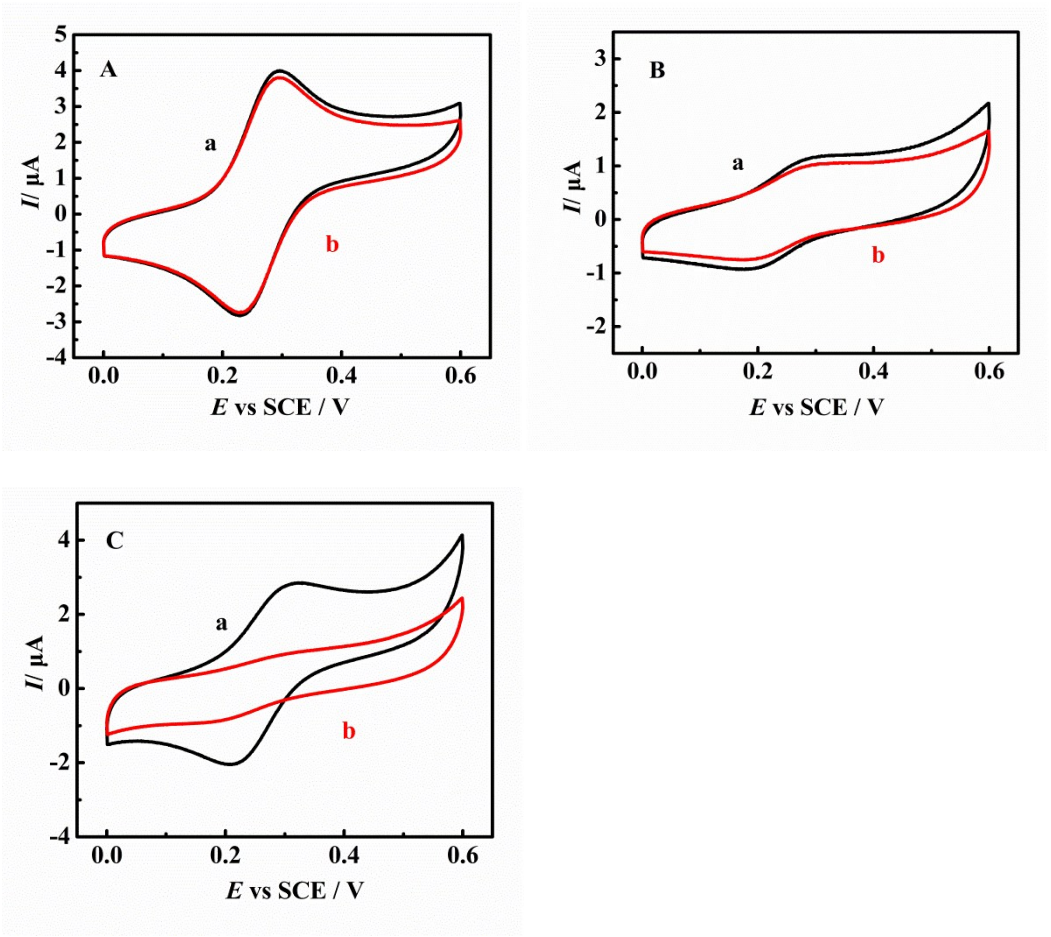

Fig. S4 CVs of 0.5 mM FCA at 0.1 V s^{-1} in pH 9.0 buffers at 37 °C at (A) bare Au, (B) PNIPAM and (C) PAPBA film electrodes with (a) 0 and (b) 0.2 M glucose, respectively.

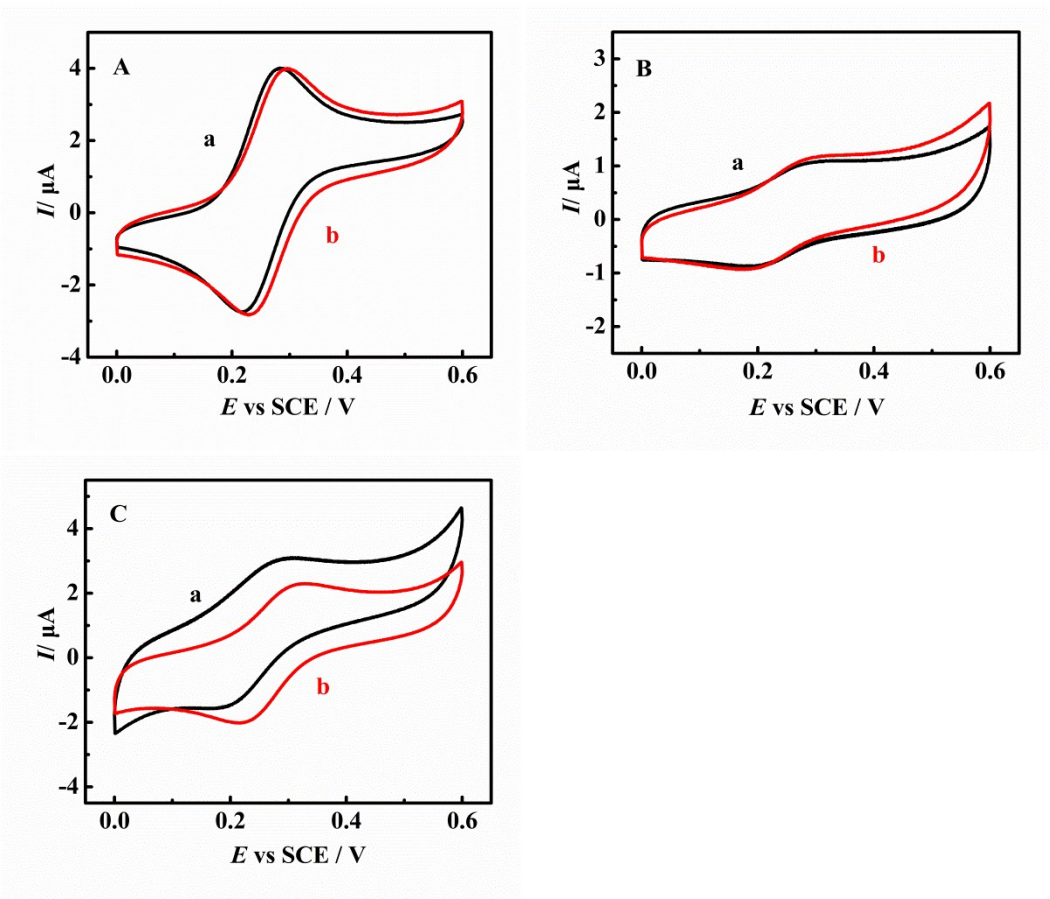

Fig. S5 CVs of 0.5 mM FCA at 0.1 V s^{-1} and at 37 °C at (A) bare Au, (B) PNIPAM and (C) PAPBA film electrodes in (a) pH 7.0 and (b) pH 9.0 buffers, respectively.

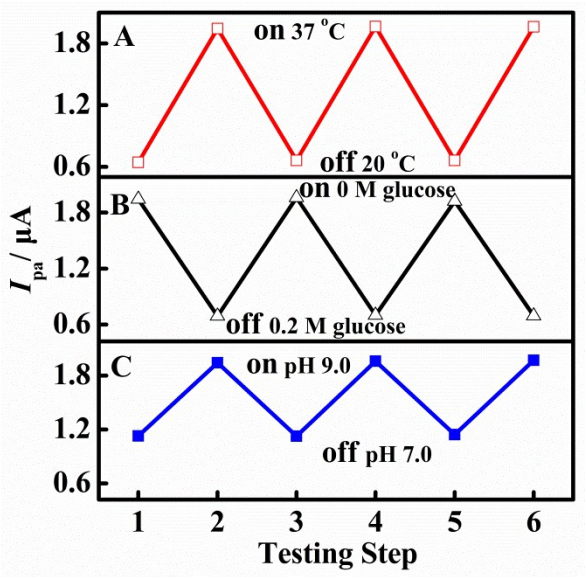

Fig. S6 Dependence of CV I_{pa} of 0.5 mM FCA at 0.3 V for P(NIPAM-*co*-APBA) films at 0.01 V s^{-1} in buffers containing 5 mM NADH on (A) the solution temperature switched between 20 and 37 °C at pH 9.0, (B) the glucose concentration cycled between 0 and 0.2 M at pH 9.0 and 37 °C, and (C) the solution pH switched between 7.0 and 9.0 at 37 °C.

Table 2S Truth table of the 4-input/4-output logic gate circuit on the platform of FCA solution and P(NIPAM-*co*-APBA) films

Input A T	Input B pH	Input C NADH	Input D Glucose	Output 1 $I_{pa} < 0.3$	Output 2 $0.3 \le I_{pa} < 0.9$	Output 3 $0.9 \le I_{pa} < 1.4$	Output 4 $I_{pa} \ge 1.4$
0	0	0	0	0	1	0	0
0	0	0	1	1	0	0	0
0	0	1	0	0	1	0	0
0	0	1	1	0	1	0	0
0	1	0	0	0	1	0	0
0	1	0	1	1	0	0	0
0	1	1	0	0	1	0	0
0	1	1	1	0	1	0	0
1	0	0	0	0	1	0	0
1	0	0	1	0	1	0	0
1	0	1	0	0	0	1	0
1	0	1	1	0	1	0	0
1	1	0	0	0	1	0	0
1	1	0	1	0	1	0	0
1	1	1	0	0	0	0	1
1	1	1	1	0	1	0	0

A

Input C (NADH)	Input D (glucose)	Output 4 $I_{pa} \geq 1.4$ µA
0	1	0
1	0	1

B

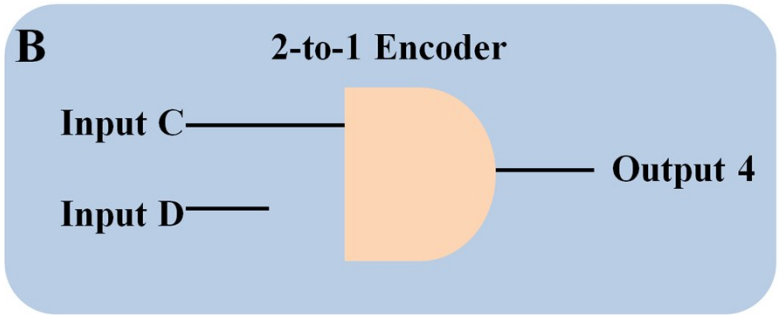

Fig. S7 (A) Truth tables and (B) schematic representation of 2-to-1 encoder on the platform of FCA solution at 37 °C and pH 9.0 and P(NIPAM-*co*-APBA) films with NADH and glucose as 2 inputs and Output 4 as the output.