Electronic Supplementary Material (ESI) for RSC Advances.

Nanostructural morphology master-regulated the cell capture efficiency of multivalent aptamers

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Table S1 DNA names and sequences used in this study

Name	Sequence（5’→3’）	Modification
Template	*GGGAGTGGGAAGGTTGGGGT*AAAACGGCTA**AGGAGGAGA CCCTGAACAGCCACCGAACTATCCTCCT**AACACGACTA *AAAATAAAAAAAATTAAA*	5'-PO_4
Splint	TTTTTTTTTT*ACCCCAACCTTCCCACTCCCTTTAATTTTTTTTAT TTT*	5’-NH_2
Mono aptamer	TTTTTTTTTTTTTTTTTTTT**AGGAGGATAGTTCGGTGGCT GTTCAGGGTCTCCTCCT**	5’-NH_2
Probe	GACCCTGAACAGCCACCGAACTA	5’-FAM
Template_scr	GCCAACTAAACTCACTAACACCCACACACACACAACCCAA CAACACACACACAACACTCCACTCCATCACACACTCTATA AAATAATCTACACAT	5'-PO_4
Splint_scr	TTTTTTTTTTTGTTAGTGAGTTTAGTTGGCATGTGTAGATT ATTTTAT	5’-NH_2
Probe_scr	CTCCACTCCATCACACACTCTAT	5’-FAM

All spacer sequences were underlined, while the aptamer (Mono), its reverse and complement sequences (Template) were in bold, and other italic sequences were for specific hybridization. FAM was the abbreviation of fluorescein amidite, which was a fluorophore.

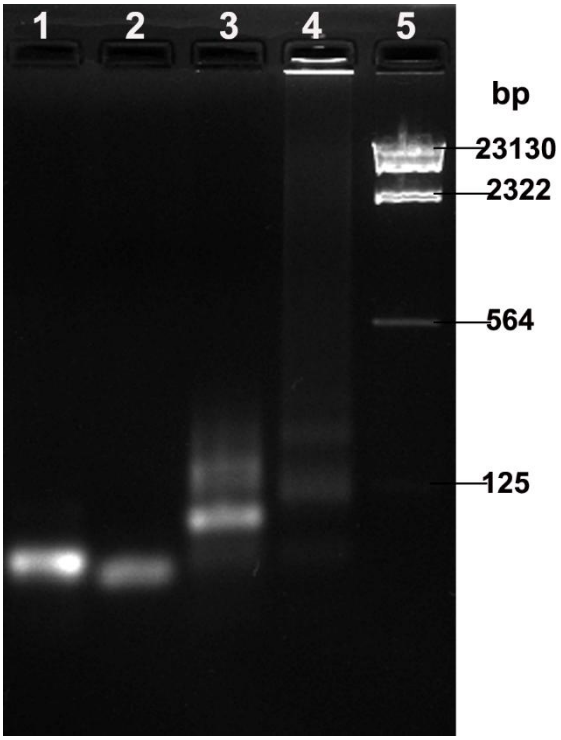

Fig. S1 Gel image of RCA procedure. Lane 1: RCA template. Lane 2: splint. Lane 3: circular template. Lane 4: RCA products. Lane5: λ-Hind III digest DNA marker.

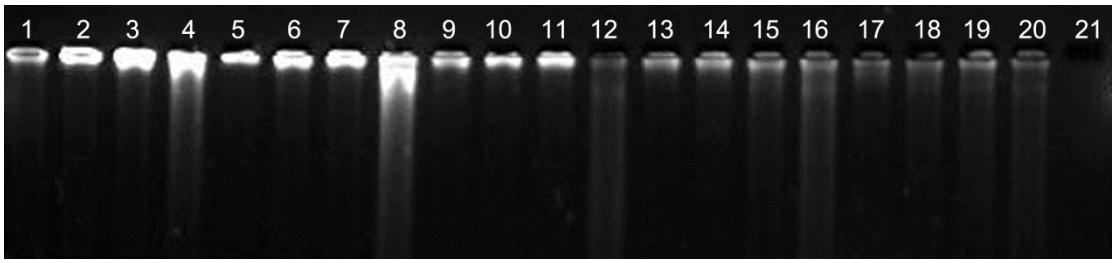

Fig. S2 Gel images of RCA products amplified by different concentrations of phi29 enzyme and RCA reaction time. (Lane 1~4，with 100 U/μL phi29 enzyme, and 10 min,30 min,90 min, 24 h RCA reaction time. Lane 5~8: with 50 U/μL phi29 enzyme, and 30 min, 90 min, 120 min, 24 h RCA reaction time. Lane 9~15: with 25 U/μL phi29 enzyme, and 90 min, 120 min, 240 min, 24 h RCA reaction time. Lane 13~16: with 10 U/μL phi29 enzyme, and 120 min, 240 min, 480 min, 24 h RCA reaction time. Lane 17~20: with 5 U/μL phi29 enzyme, and 240 min, 480 min, 720 min, 24 h RCA reaction time. Lane 21: with 0 U/μL phi29 enzyme and 24 h RCA reaction time.

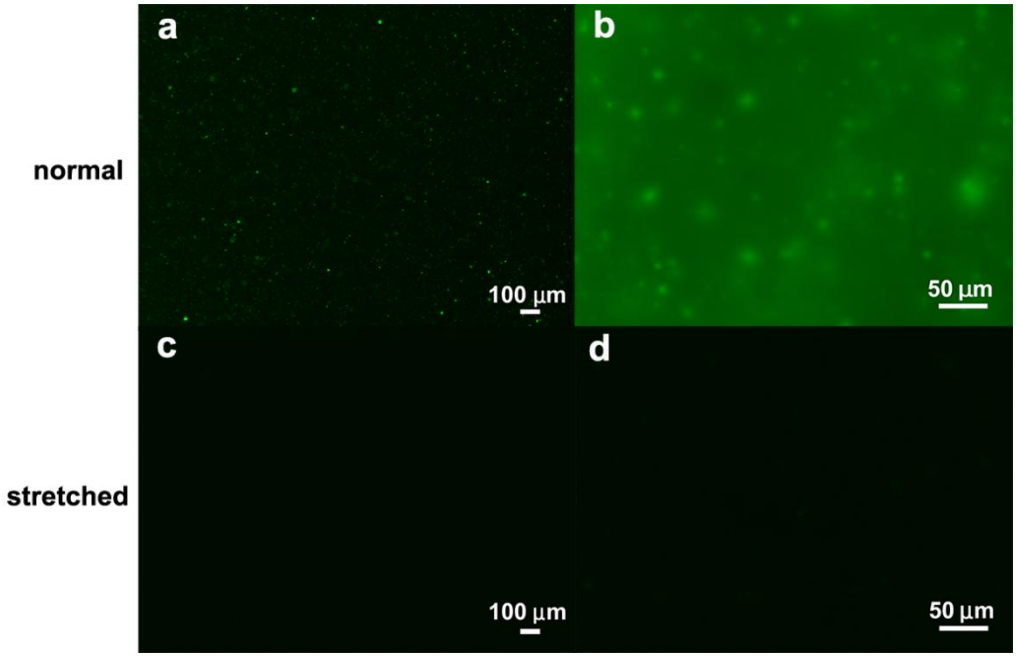

Fig. S3 Fluorescence images of RCA amplified multivalent aptamers with 540 min reaction time, stained with SYBR Green I. Fluorescence images of the normal sample with low (a) and high (b) magnification. Fluorescence images of the stretched sample with low (c) and high (d) magnification.

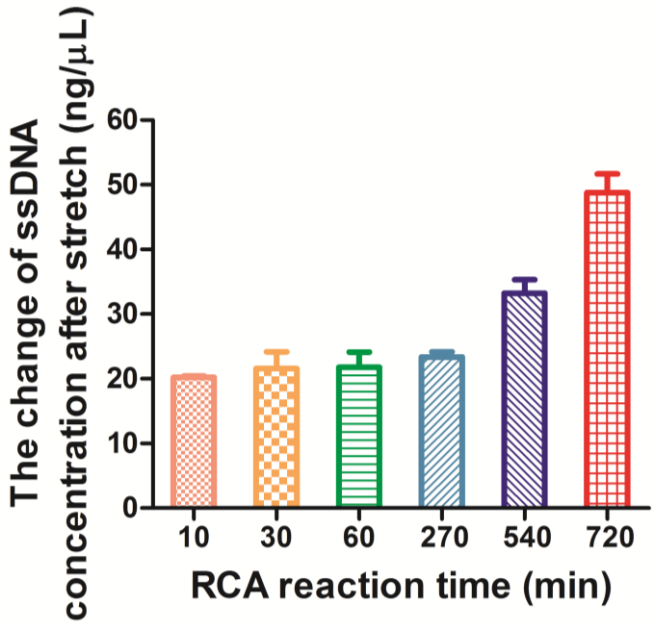

Fig. S4 The changes of ssDNA concentrations between the normal and the correspondingly stretched RCA-samples.

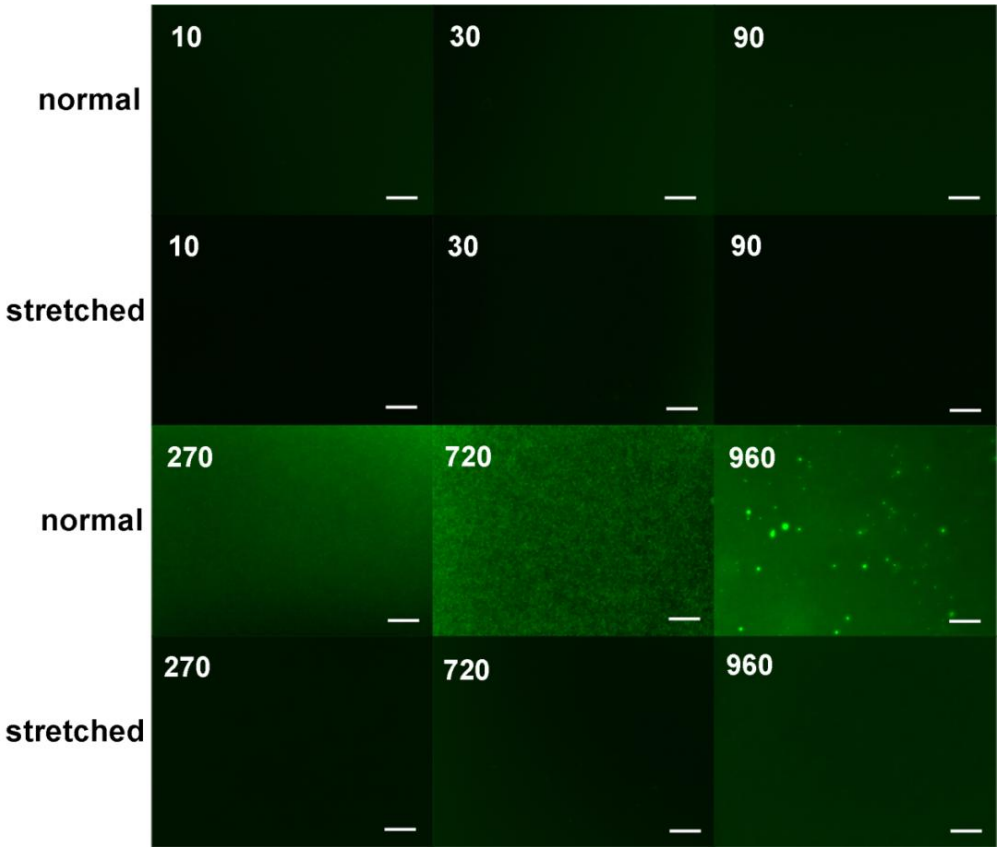

Fig. S5 Fluorescence images of the multivalent aptamer amplified by RCA with different reaction time stained with SYBR Green I on PEG-hydrogel. The labels in the fluorescence images are the RCA reaction time. Scale bars are 50 μm.

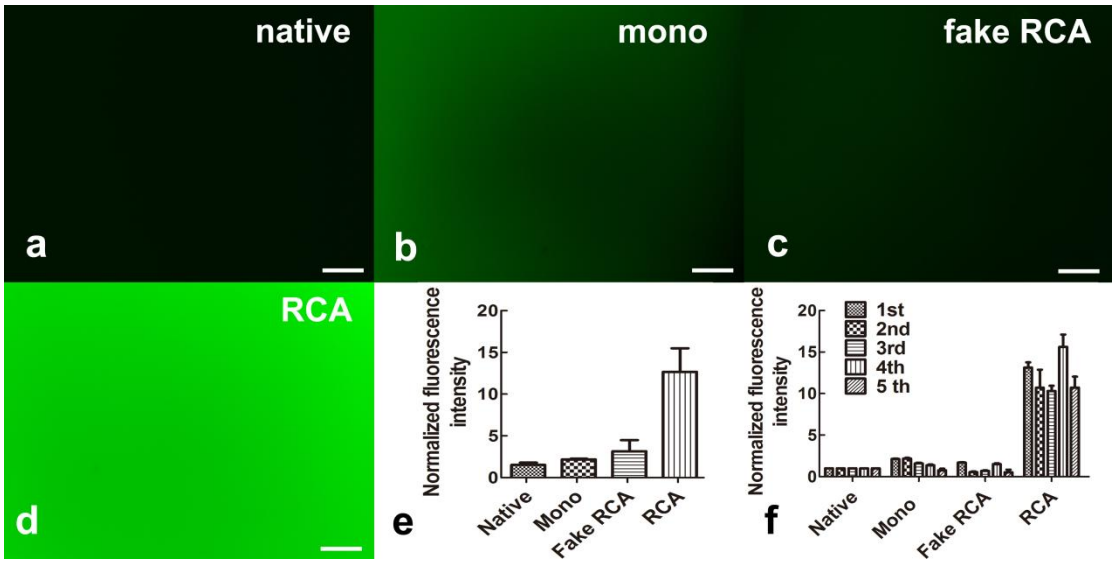

Fig. S6 Fluorescent images of PEG-hydrogels with different surface-modification stained with specific fluorescence probes.(a) PEG hydrogel stained with fluorescence probe (native). (b) 5 μM aptamer modified hydrogel stained with fluorescence probe (mono). (c)Multivalent aptamer amplified by fake RCA (without phi29 enzyme) modified hydrogel stained with fluorescence probe (fake RCA). (d) Multivalent aptamer amplified by RCA modified hydrogel stained with fluorescence probe (RCA). (e) Fluorescence quantitative intensity of probe on PEG-hydrogels with different modification.(f) Fluorescence quantitative intensity with five time release and re-capture the specific probes. Scale bars are100 μm.

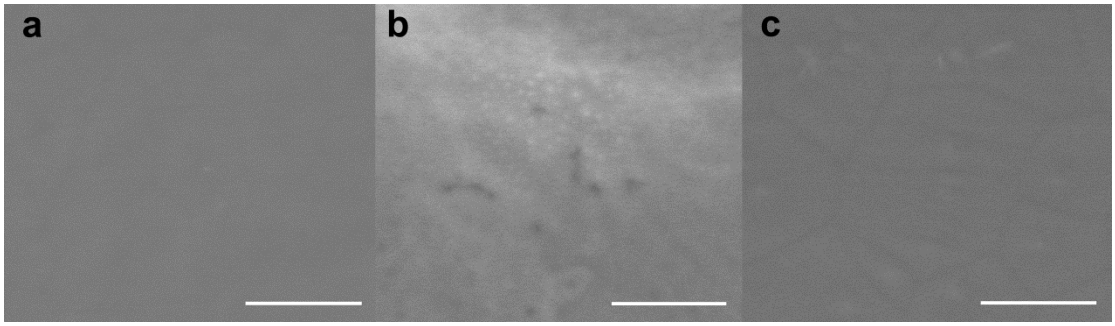

Fig. S7 Environmental scanning electron microscope (ESEM) images of PEG-hydrogel surface. (a) PEG-hydrogel. (b) PEG-hydrogel with normal multivalent aptamer. (c) PEG-hydrogel with stretched multivalent aptamer. Scale barsare20μm.

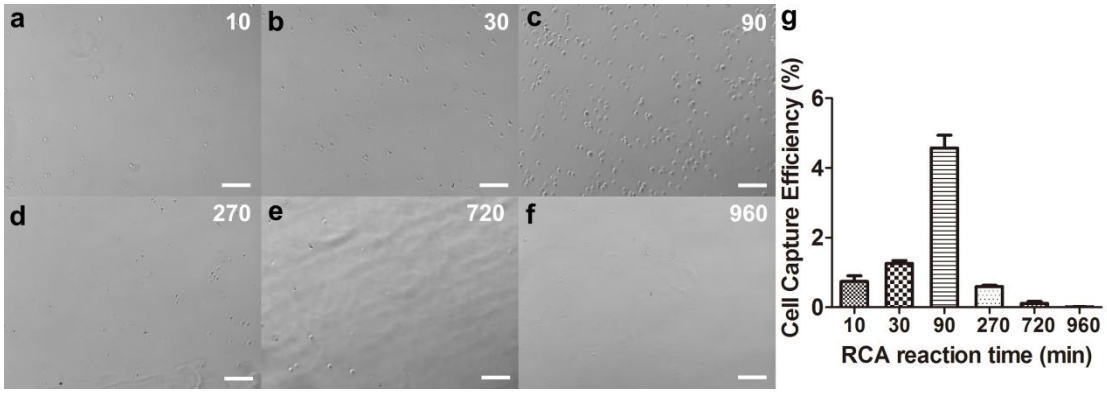

Fig. S8 Cell capture efficiency by the normal multivalent aptamer with various RCA reaction time. (a) 10 min, (b) 30 min, (c) 90 min, (d) 270 min, (e) 720 min, (f) 960 min, (f) Statistical results of cell capture efficiency. Scale bars are100 μm.

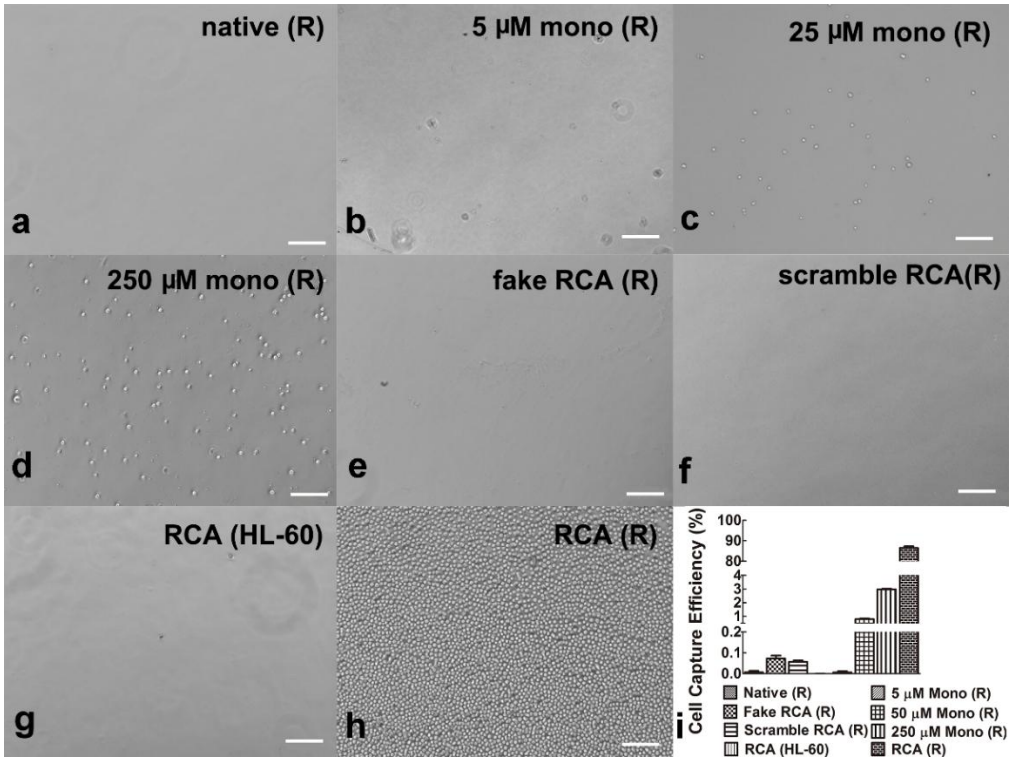

Fig. S9 Cell capture efficiency and specificity. (a) Native PEG-hydrogel capture Ramos cells, (b) 5 μM mono aptamer modified PEG-hydrogel capture Ramos cells. (c) 50 μM mono aptamer modified PEG-hydrogel capture Ramos cells. (d) 250 μM mono aptamer modified hydrogel capture Ramos cells. (e) Fake RCA modified hydrogel capture Ramos cells. (f) Scramble RCA modified hydrogel captureRamos cells. (g) RCA modified hydrogel capture control cells (HL-60). (h) RCA modified hydrogel capture Ramos cells. (i) Statistical results of cell capture efficiency and specificity. Scale bars are 100 μm.

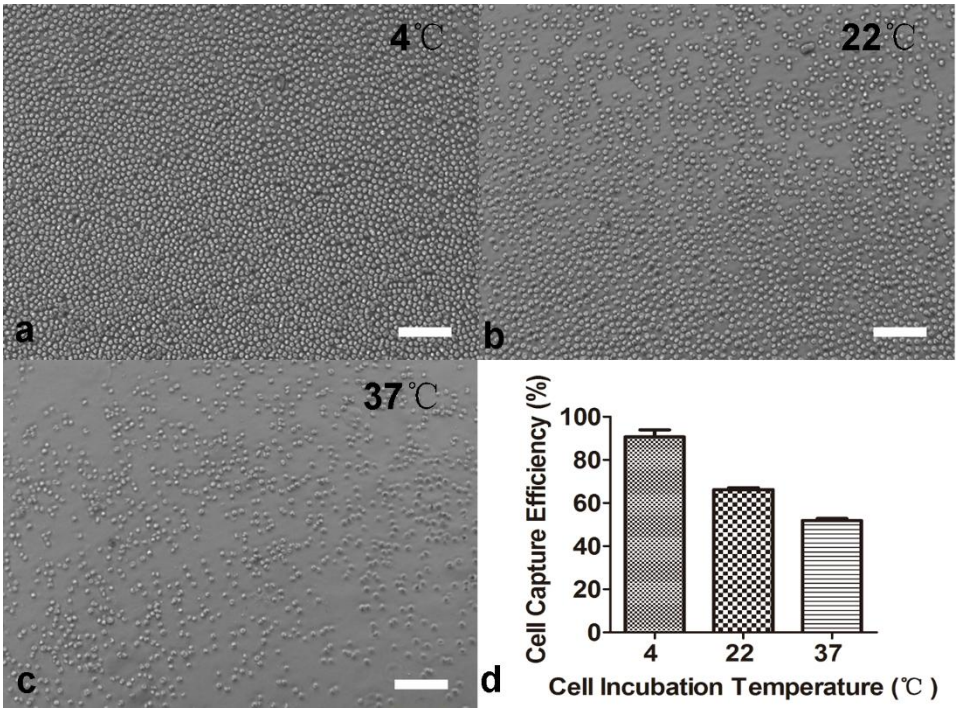

Fig. S10 Cell capture efficiency at different temperature.(a) 4 ℃, (b) 22 ℃, (c) 37 ℃, (d)Statistical results of cell capture efficiency and specificity at different temperature. Scale bars are 100 μm.