Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B

Supporting Information:

Development of a smart dynamic surface chemistry for surface plasmon resonance-based sensors for the detection of DNA molecules

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Table s1. Oligonucleotide sequence

Pathogens	Sequence
Salmonella spp.	Probe: 5'- $(T)_{20}$TTCTACATTGACAGAATCCTC-3'
	Target: AAGATGTAACTGTCTTAGGAG
Shigella spp.	Probe: 5'- $(T)_{20}$AAGGCAGTGTGGATAACCTATTATACTC-3'
	Target: TTCCGTCACACCTATTGGATAATATGAG
C.perfringens.	Probe: 5'- $(T)_{20}$CAAGATAGAATGTAGCTTGTTTATAGTTT-3'
	Target: GTTCTATCTTACATCGAACAAATATCAAA
Y. enterocolitica	Probe: 5' -$(T)_{20}$CAAGCAAGCTTGTGATCCTCCG-3'
	Target: GTTCGTTCGAACACTAGGAGGC
L.monocytogenes.	Probe: 5' -$(T)_{20}$AATGTGACTGGCGCTTTAATTGC-3'
	Target: TTACACTGACCGCGAAATTAACG
B. cereus	Probe: 5' -$(T)_{20}$TGCTAGCGTATCAAAATCGTATACTGTTGTTTC-3'
	Target: ACGATCGCATAGTTTTAGCATATGACAACAAAG
V. cholerae.	Probe: 5' -$(T)_{20}$CCGTGGATTCATCATGCACCGCC-3'
	Target: GGCACCTAAGTAGTACGTGGCGG
V. parahaemolyticus.	Probe: 5' -$(T)_{20}$TTGTTTGGACATCAACCGCTCATCGTCT -3'
	Target: AACAAACCTGTAGTTGGCGAGTAGCAGA
S. aureus.	Probe: 5' -$(T)_{20}$CACGACTAAATAGACGCTCATTCGCGATTTT-3'
	Target: GTGCTGATTTATCTGCGAGTAAGCGCTAAAA
C. jejuni.	Probe: 5'-$(T)_{20}$CGTTTAAGCTCTATAACAACGCGG-3'
	Target: GCAAATTCGAGATATTGTTGCGCC
E.coli O157:H7	Probe: 5' -$(T)_{20}$TTTCGATGAGTTTATCTGCAAGGTGATTCCTTAA-3'
	Target: AAAGCTACTCAAATAGACGTTCCACTAAGGAATT

The stoichiometry of an inclusion complex between α-CDs and PEG: The stoichiometry of an inclusion complex between α-CDs and PEG has been clarified by A. Harada et al., who found that two repeating units of ethylene glycol are included within one α-CD molecule[s1]. In this study, we used SPR to rough evaluate the stoichiometry between α-CDs and PEG. The SPR signal was recorded to be 1200 RU after threaded with CD, while the PEG SAM cause a SPR signal was 600 RU. The stoichiometry was rough evaluated using follow equation:

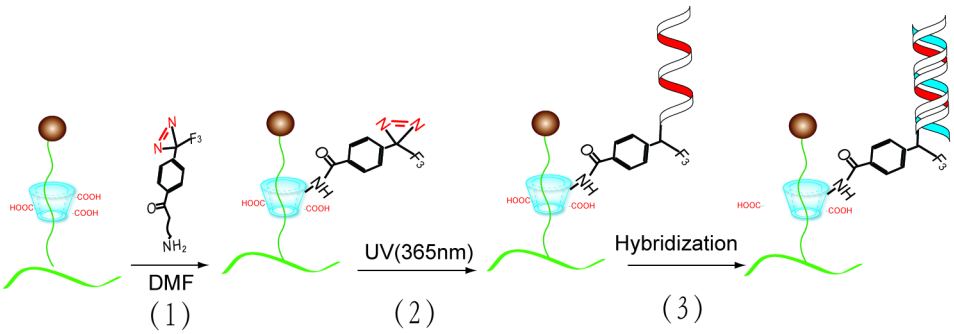
$$Ration_{PEG:CD} = \frac{RU_{PEG}}{M_{PEG}} : \frac{RU_{CD}}{M_{CD}} \qquad (1)$$

where RU_{PEG} and RU_{CD} are the SPR signal changed caused for long PEG and CD introduction, respectively, and M_{PEG}=3400 g/mol is the molecule weight of long PEG, M_{CD}=1212 g/mol is the molecular weight of α-CD.

$$Ratio_{PEG:CD} = \frac{600}{3400} : \frac{1200}{1212.9} = 1:5.6 \qquad (2)$$

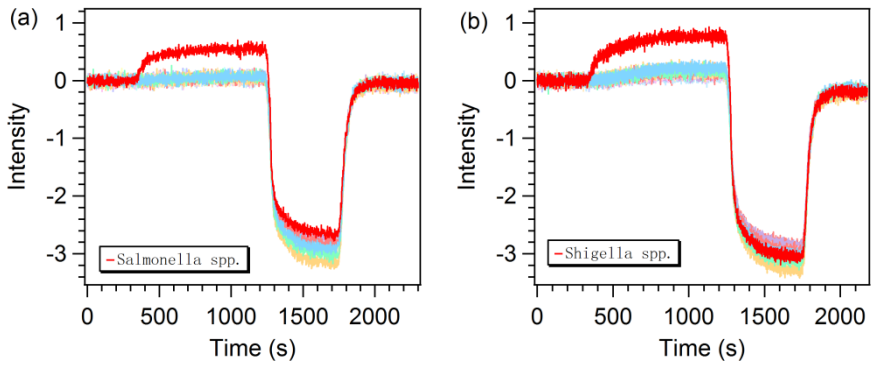
This means that nearly 5.6 molecule CDs on each PEG chain.

Immobilization of DNA probe on a dynamic matrix through a photo-cross reaction: The chip modified with carboxyl polyrotaxane was first treated with a photo-cross linker to yield photoreactive groups on α-CDs molecules. DNA probe solutions were then printed on a photo-cross linker-coated chip. Immobilization should occur in a functional group independent manner via UV irradiation at a 365 nm wavelength treatment for 30 minutes



Scheme s1. Diagrammatic representation of DNA probe immobilization on a dynamic matrix with a photo-cross reaction. (1) The introduction of a photo-cross linker to the polyrotaxane matrix; (2)Immobilization of DNA probe using a photo-cross reaction via UV irradiation of 2.8 J/cm^2 at 365 nm wavelength for 30 minutes; and (3) DNA hybridization.

Detection of DNA targets of foodborne pathogenic microorganisms: After immobilizing DNA probes, the corresponding solution of synthesis target DNA (2 μM) related to food-borne pathogenic microorganisms were injected into the SPR monitoring system with a flow rate of 2 μL min^{-1}. The hybridization interaction was monitored for 800 seconds, and then the surface was washed by PBS buffer solution to remove the unbound target DNA. In all experiments, probes were regenerated with 10 mM NaOH for 1000 seconds



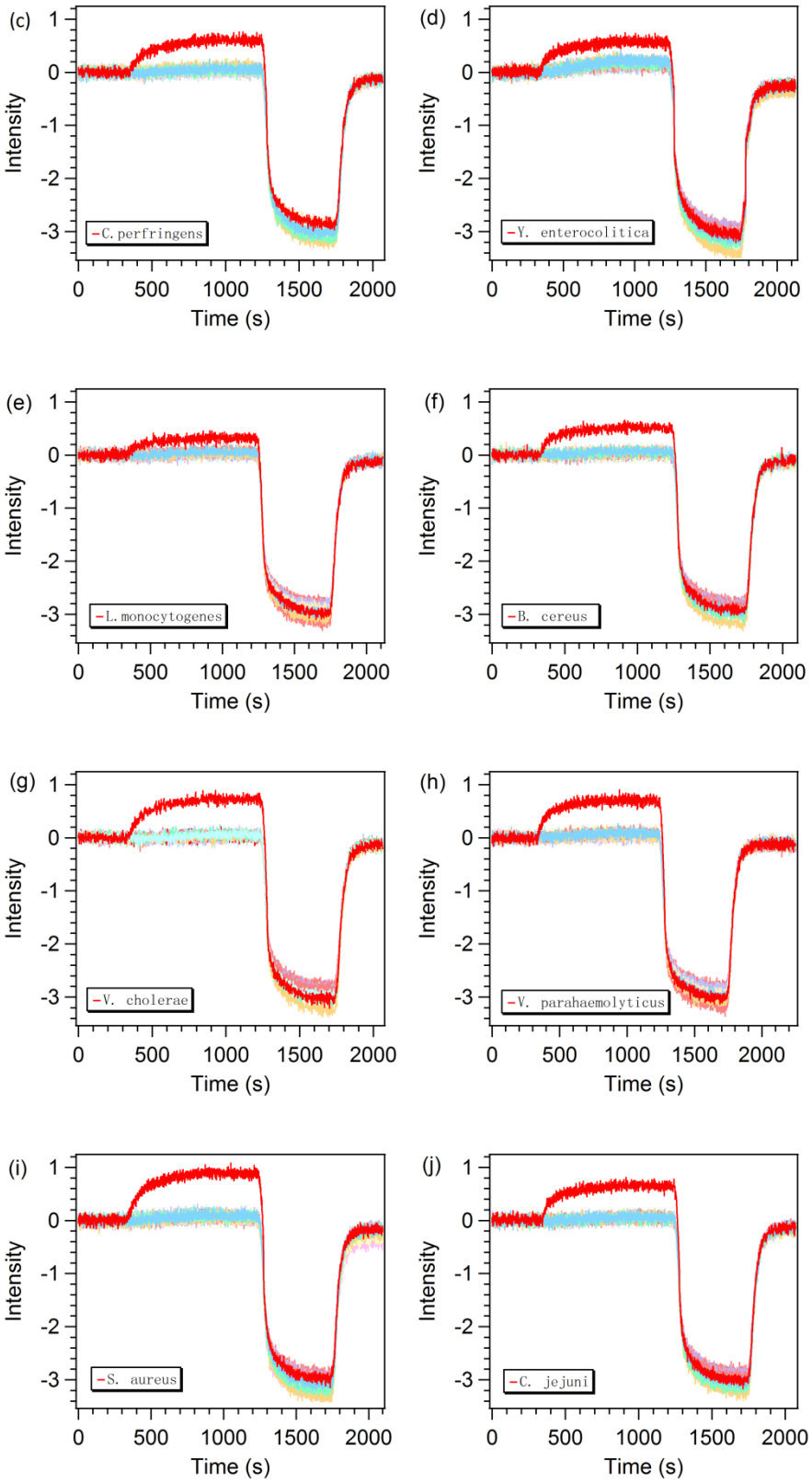


Fig. s1. Typical SPR response curves for target DNA of food-borne pathogenic microorganism detection. (a) *Salmonella spp* (red); (b) *Shigella spp*; (c) *C.perfringens*;

(d) *Y. enterocolitica*; (e) *L.monocytogenes*; (f) *B. cereus*; (g) *V. cholera*; (h) *V. parahaemolyticus*; (i) *S. aureus* and (j) *C. jejuni.* In all figure, the red curve corresponds to the special probe to a given target DNA. The other curves correspond to other ten food-borne pathogenic microorganism probes for the given DNA.

References

S1. A. Harada; Li, J.; Kamachi, M, *Macromolecules* 1993, **26**, 5698.