

## **Electronic Supplementary Information**

# **Efficient immobilization of enzymes onto magnetic nanoparticles by DNA strand displacement: a stable and high-performance biocatalyst**

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**Fluorescein-labeled enzyme.** 5 mg of fluorescein isothiocyanate (FITC) were dissolved in 0.5 M carbonate buffer (pH 9.5) to give a final concentration of  $0.2 \text{ mg mL}^{-1}$  FITC, and 25 mg of ALP were dissolved in 0.5 M carbonate buffer (pH 9.5) to give a final concentration of  $1 \text{ mg mL}^{-1}$  ALP. 1 mL of the above FITC was added to 20 mL of above ALP, and the resulting solution was incubated at 300 rpm for 4 h in dark conditions. The excess FITC was removed through dialysis against deionized water for 48 h, and the deionized water was replaced with fresh one at 2 h intervals. Further, FITC-labeled ALP was prepared and used to prepare the FITC-labeled ALP-target DNA (24bases) conjugates as described above. The rhodamine B isothiocyanate (RhB)-labeled HRP-target DNA (44bases) conjugates were prepared in a similar manner.

**Table S1** Sequences of the DNA oligonucleotides used in the experiments.

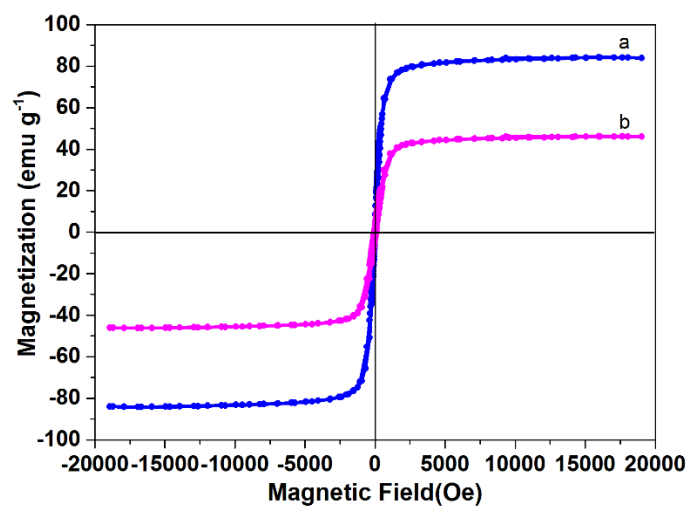
Name		Sequence (from 5' to 3')
Capture DNA	C <sub>44</sub>	5'-CTAGCTTGTCGTAATACCAGGGTCGTAGTAGTCAGTAGTAGTCA-NH <sub>2</sub> -3'
Target DNA	T <sub>24</sub>	5'-GACCCTGGTATTACGACAAGCTAG-SH-3'
	T <sub>44</sub>	5'-TGACTACTACTGACTACTACGACCCTGGTATTACGACAAGCTAG-SH-3'

**Table S2** Domain sequences.

domain	Sequence (from 5' to 3')
a	GACCCTGGTATTACGACAAGCTAG
a*	CTAGCTTGTCGTAATACCAGGGTC
b	TGACTACTACTGACTACTAC
b*	GTAGTAGTCAGTAGTAGTCA

**Table S3** Results of elemental analysis for magnetic materials.

Compound	N (%)	C (%)	H (%)
Fe <sub>3</sub> O <sub>4</sub>	0.03	2.15	0.39
Fe <sub>3</sub> O <sub>4</sub> @SiO <sub>2</sub>	0.24	2.17	0.54
MNPs	0.40	3.11	0.71
MNPs@DNA-HRP	0.47	3.99	0.98



**Fig. S1** Magnetization curves of (a)  $\text{Fe}_3\text{O}_4$  and (b) MNPs@DNA-HRP.