SUPPORTING INFORMATION

Materials and measurements:

DNAs were synthesized by Shanghai Biological Engineering Technology & Services (Shanghai, China). PTCDI was prepared as the literature reported[1]. Exonuclease III was purchased from Takara Biotechnology Co. Ltd. (Dalian, China). Other chemicals were of analytical reagent grade and used without further purification. All water used to prepare buffer solution was obtained by using a Milli-Q water system. Fluorescence measurements were carried out by using a JASCO FP-6500 spectrofluorometer. UV melting experiments were carried out on a Cary 300 UV/Vis spectrophotometer equipped with a Peltier temperature control accessory.

Table S1. DNA sequences used in the work

Name	Sequence
S	5'-GAG ACT GGC GCA CAG AGG AAG AGA-3'
T	5'-TCT CTT CCT CTG TGC GCC AGT CTC TCC CAGG-3'
T1	5'-TCT CTT CCT CTG TGC GCC GGT CTC TCC CAGG-3'
T2	5'-TCT CTT CCT CTG TCC GCC GGT CTC TCC CAGG-3'
T3	5'-TCT CTA CCT CTG TCC GCC GGT CTC TCC CAGG-3'

*S, T, T1, T2, T3 represent ssDNA substrate, completely matched, one-base, two-base and three-base mismatched targets, respectively. Underlined letters represent the mismatched bases.

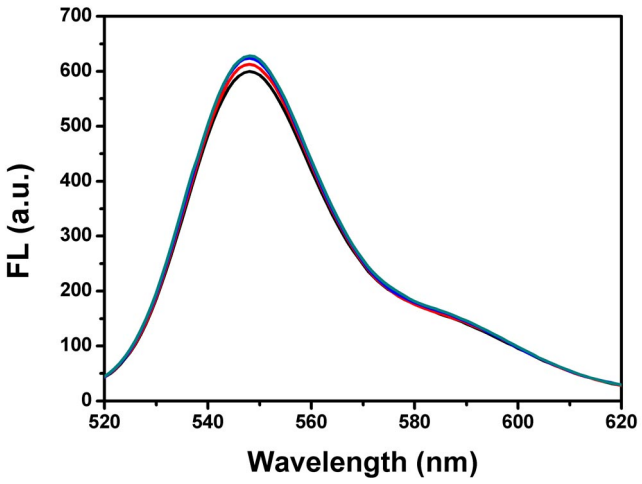

Fig. S1. Change in the fluorescence emission spectra of PTCDI (1.0 μM in 5 mM tris-buffer solution, 5 mM $MgCl_2$, 50 mM NaCl, pH 8.0) upon various concentration of target DNA: 0, 0.1, 1, 10 nM (from top to bottom).

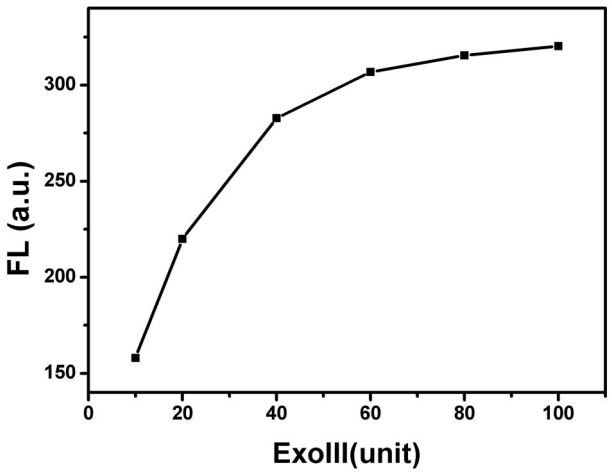

Fig. S2. Fluorescence signal for the detection of target with different amounts of Exo III. Experiment was performed in the presence of 1.0 μM PTCDI, 200 nM ssDNA substrate, 10 nM perfectly matched target ssDNA in 5 mM Tris-buffer solution, 5 mM $MgCl_2$, 50 mM NaCl, pH 8.0 at 37 ^{o}C for 30 min. 40 units of Exo III were chosen in the following experiment.

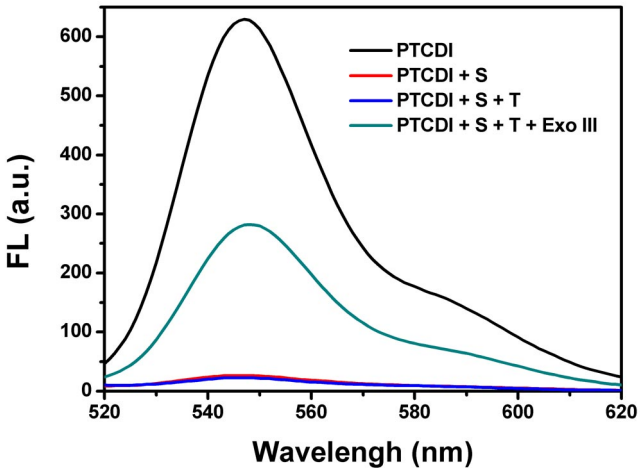

Fig. S3. Fluorescence emission spectra of PTCDI before and after addition of 200 nM substrate, 10 nM target and 40 units Exo III.

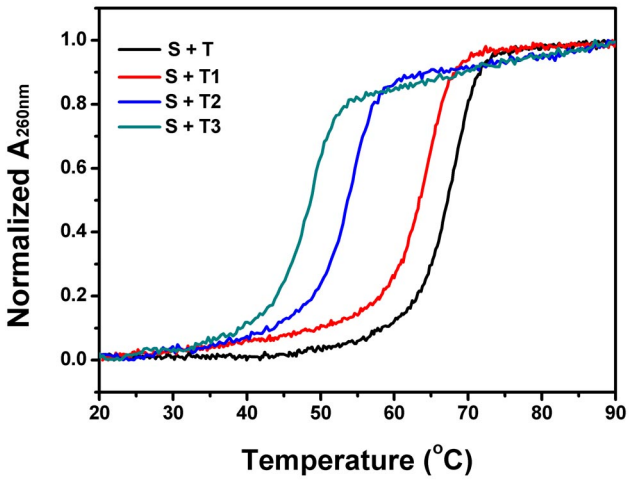

Fig. S4. UV melting profiles of ssDNA substrate with perfectly matched, one-base mismatched, two-base mismatched, three-base mismatched target DNA, respectively. Experiment was conducted in 5 mM Tris-buffer solution, 5 mM $MgCl_2$, 50 mM NaCl, pH 8.0.

1 B. Wang and C. Yu, *Angew. Chem., Int. Ed.*, 2010, **49**, 1485-1488.