Electronic Supplementary Information

Highly Effective Target Converting Strategy for Ultrasensitive Electrochemical Assay of Hg^{2+}

Jin Lv,[a,b] Shunbi Xie,[a,*] Wei Cai, [a,b] Jin Zhang,[a,b] Dianyong Tang[a] and Ying Tang[a,*]

a Chongqing Key Laboratory of Environmental Materials and Remediation Technologies (Chongqing University of Arts and Sciences), Chongqing University of Arts and Sciences, Chongqing 402160, PR China. E-mail: tangying2282@163.com (Y. Tang); xieshunbi@163.com (S. B Xie); Tel: +86-23-49891739.

b College of Chemistry and Chemical Engineering, Southwest University, Chongqing 400715, PR China

E-mail: tangying2282@163.com (Y. Tang); xieshunbi@163.com (S. B Xie); Tel: +86-23-49891739.

The characterization of AuNPs and Au@PSC

The AuNPs and Au@PSC was characterized by transmission electron microscope (TEM) and scanning electron microscope (SEM), respectively. The corresponding description was listed as follow: As can be seen from Figure S1A, the TEM of the AuNPs presented a uniform size with the average size of 16 nm, which provided valuable data about the real shapes of the nanoparticles. As shown in Figure. S1B, AuNPs were well-distributed on the surface of magnetic microsphere. This result also validated that the proposed Au@PSC was successfully prepared.

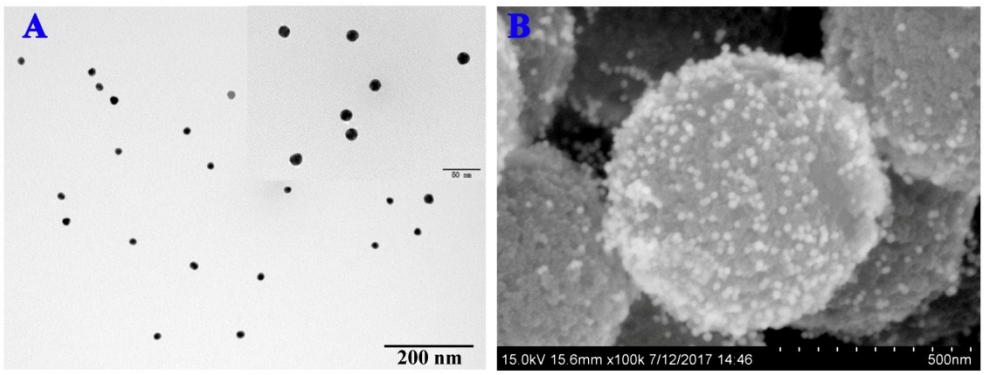

Figure S1. (A) TEM image of AuNPs; (B) SEM image of Au@PSC.

The optimization T-T mismatch numbers in sequences of D3

Since the sensing strategy is based on the proximity hybridization triggered by T-Hg^{2+}-T specific recognition, the number of T-T mismatches in the sequences of D3 is very important. The D3 with less mismatches could result in a relatively low signal response owing to the weak stability of the D2/D3 DNA duplex, which could not then trigger the proximity hybridization. However, more T-T mismatches contained in D3 could also induce a relatively low signal response, because more Hg^{2+} were needed to form the T-Hg^{2+}-T mismatches. Therefore, we optimized the number of T-T mismatches in the sequences of D3. Four D3 sequences with the number of T-T mismatches ranging from 5 to 20 were designed and their electrochemical response were examined, respectively. Figure S2 showed the DPV peak current, indicating that D3 sequence with 15 T-T mismatches gives the biggest current change. Therefore, D3 sequence with 15 T-T mismatches was used in the whole experiments.

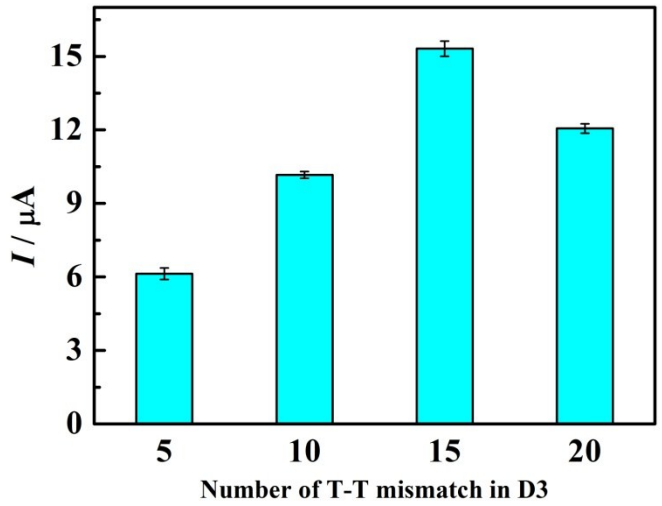

Figure S2. the DPV peak current of the system by using D3 with different numbers of T-T mismatch.

Polyacrylamide gel electrophoresis analysis of the target induced RCA

The polyacrylamide gel electrophoresis was carried out to verify the feasibility of target induced RCA. As shown in Figure S3, the distinct bands in Lane 1, Lane 2 correspond to the circular DNA and D3, respectively. The sample of the RCA products without the addition of Hg^{2+} displayed two bands (Lane 3), consisting of a band (the top band in Lane 3) matched the sequence of D3, and another band (the bottom band in Lane 3) matched the sequences of circular DNA. This phenomenon indicated that RCA could not be completed without the target Hg^{2+}. While the RCA sample with Hg^{2+} appeared a bright band in the top of the lane (lane 3), indicating that the RCA has been performed successfully. These results demonstrated the feasibility of our design.

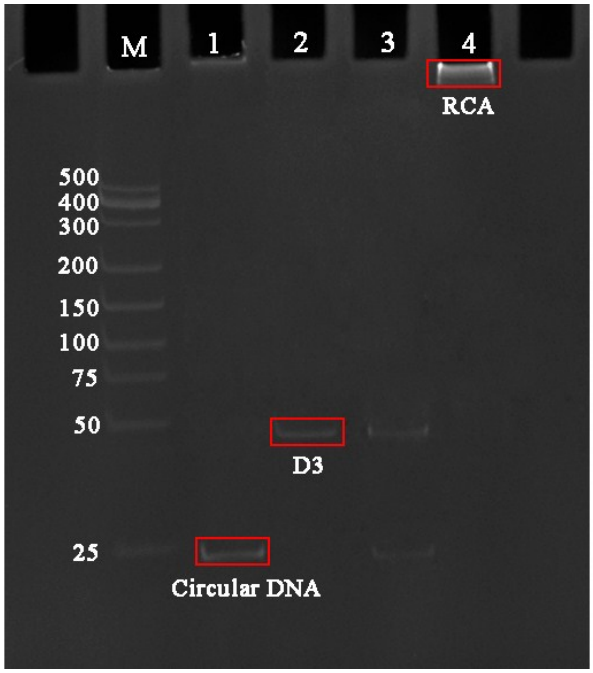

Figure S3 Polyacrylamide gel electrophoresis analysis of the target induced RCA: Lane 1, circular DNA; Lane 2, D3; Lane 3, the sample of the RCA products without Hg^{2+}; Lane 4, the sample of the RCA products with Hg^{2+}.