1   **Electronic Supplementary Information for**

2   **Amplified electrochemiluminescent aptasensor using Au**

3   **nanoparticles capped 3,4,9,10-perylene tetracarboxylic acid-**

4   **thiosemicarbazide functionalized C$_{60}$ nanocomposites as**

5   **signal enhancement**

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10   **The preparation of the comparison of the different nanomaterials and their**

11   **corresponding UV-vis absorption spectroscopy (UV) characterization**

12   **Preparation of TSC-PTC nanocomplexes**

13   Briefly, 100 μL of freshly prepared EDC/NHS solution (40 mM EDC, 10 mM NHS)

14   was added into 300 μL PTCA solution (1mg/mL) for 30 min to activate the carboxyl

15   group. Afterwards, 300 μL of 10 mM TSC was added for 12 h under stirring,

16   followed by centrifuging and washing twice by distilled water. The prepared material

17   was dispersed in distilled water and stored at 4°C when not used.

18   **Preparation of AuNPs/TSC-PTC/C$_{60}$NPs nanocomplexes**

19   Firstly, the PTCA functionalized C$_{60}$NPs was synthetized with the next steps. 300 μL

20   PTCA solution (1mg/mL) and 650 μL C$_{60}$NPs (1mg/mL) were mixed together with

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21 stirring for 12 h and then the resultant mixture was centrifuged and washed for several

22 times by distilled water. Afterwards, 100 μL of freshly prepared EDC/NHS solution

23 (40 mM EDC, 10 mM NHS) was added into the above C_{60}NPs/PTCA solution for 30

24 min to activate the carboxyl group. Subsequently, 300 μL of 10 mM TSC was added

25 for 12 h under stirring, followed by centrifuging and washing twice by distilled water.

26 Finally, 150 μL prepared AuNPs solution was added into the mixture for about 12 h

27 with stirring. In order to remove the excess AuNPs, the resulting mixture was also

28 washed for several times by distilled water. The prepared nanocomplexes was stored

29 at 4°C until use.

30 **UV-vis absorption spectroscopy (UV) characterization**

31 UV was used to characterize the successful preparation of different nanomaterials

32 (Fig. S1). Firstly, from the Fig. S1 A, we could see that C_{60}NPs had three strong

33 absorption at 209, 265, and 345 nm, respectively (curve a), which is in accordance

34 with the reported results.[1] PTCA had two characteristic absorption peaks at 470 and

35 551 nm (curve b). After the PTCA/C_{60}NPs nanocomplexes was formed, the

36 absorption of C_{60}NPs showed a red-shift trend and some characteristic absorption

37 peaks of PTCA were missing (curve c), which demonstrated that PTCA/C_{60}NPs

38 nanocomplexes was successfully synthesized via π-π stacking interactions.

39 Simultaneously, as shown in Fig. S1 B, TSC had a characteristic absorption peak at

40 235 nm (curve a) and the characteristic absorption peaks of TSC-PTC nanocomplexes

41 were observed at 219, 484 and 549 nm, respectively (curve c), suggesting that the

42 successful preparation of TSC-PTC nanocomplexes. Finally, as can be seen in Fig. S1

43 C, AuNPs had a characteristic absorption peak at 521 nm (curve a). Comparing with

44 the individual nanomaterial, the spectrum of AuNPs/TSC-PTC/C_{60}NPs

45 nanocomplexes contained the characteristic absorption peaks of each individual

46 nanomaterial with a shift (curve b), which revealed that AuNPs/TSC-PTC/C_{60}NPs

47 nanocomplexes was successfully prepared.
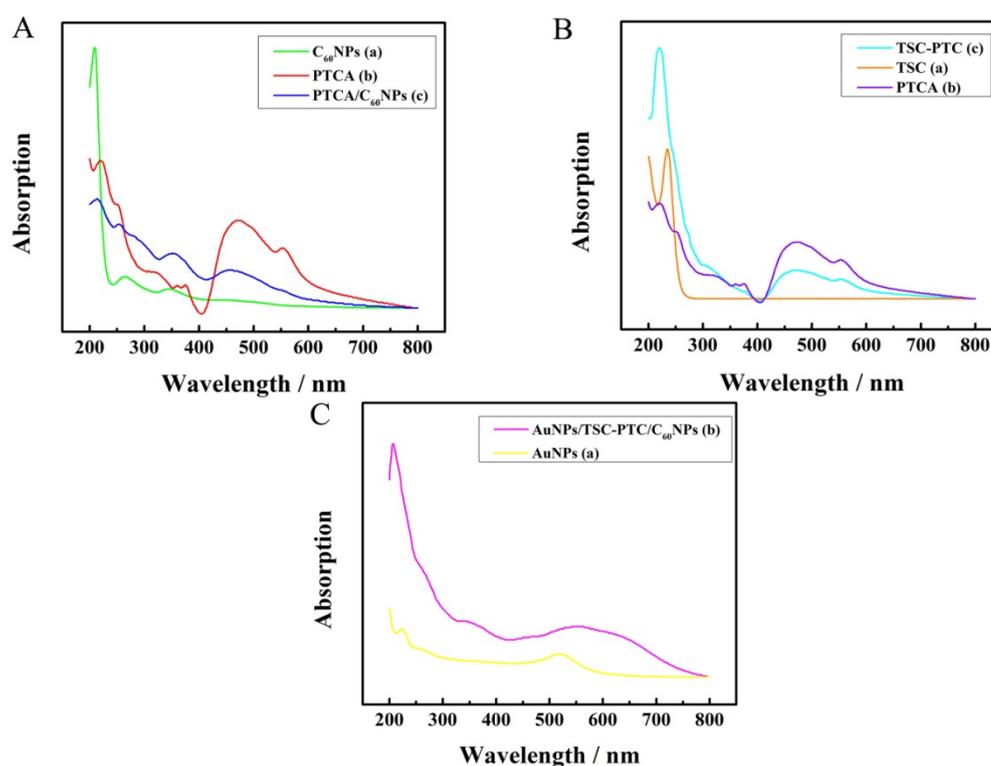
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49 **Fig. S1** UV–vis absorption spectra of **A**: (a) C_{60}NPs, (b) PTCA, (c) PTCA/C_{60}NPs, **B**:

50 (a) TSC, (b) PTCA, (c) TSC-PTC, and **C**: (a) AuNPs, (b) AuNPs/TSC-PTC/C_{60}NPs

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56 **Table S1** Comparison of the TB detection with different ECL systems.

ECL system	Co-reactant	Linear range	LOD	Sensitivity	Ref.
$Fe_3O_4@CdSe$ -$S_2O_8^{2-}$	$S_2O_8^{2-}$	1.0 pM-5.0 nM	0.12 pM	454.97	2
luminol-AuNPs	H_2O_2	5.0 pM-50 nM	1.7 pM	287.00	3
CdTe/ZnS- dGMP	O_2	1.0 nM-150 nM	0.10 nM	—	4
$S_2O_8^{2-}$-O_2	TSC-PTC	0.010 pM-10 nM	3.3 fM	1919.20	Present work

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References

59 [1] A. Graja, I. Olejniczak, A. Bogucki, D. Bonifazi and F. Diederich,

60 *Chem. Phys.*, 2004, **300**, 227－232.

61 [2] G. F. Jie, J. X. Yuan, *Anal. Chem.,* 2012, **84**, 2811–2817.

62 [3] L. Fang, C. Hua, *Biosens. Bioelectron.*, 2013, **39**, 261-267.

63 [4] P. Zhao, L. F. Zhou, Z. Nie, X. H. Xu, W. Li, Y. Huang, K. Y. He, S. Z. Yao, *Anal.*

64 *Chem.*, 2013, **85**, 6279–6286.