Electronic Supplementary Material (ESI) for Analytical Methods.

Supplementary Material

A visible and label-free colorimetric sensor for miRNA-21 detection based on peroxidase-like activity of graphene/gold-nanoparticles hybrids

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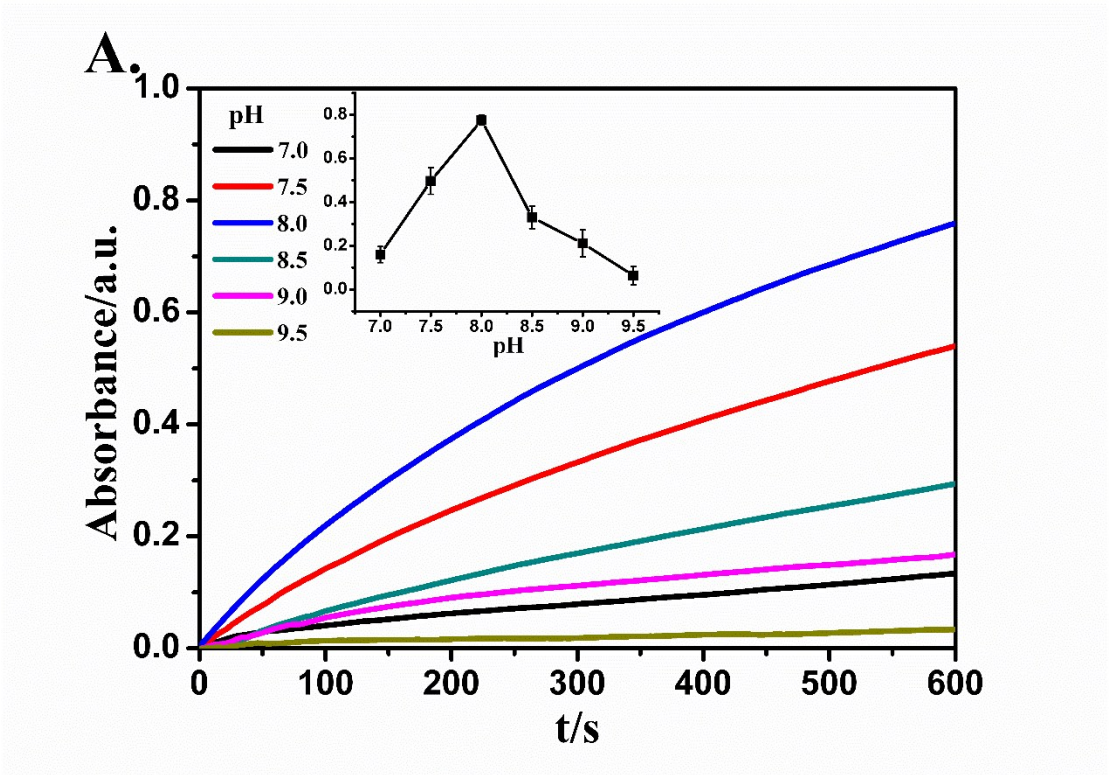
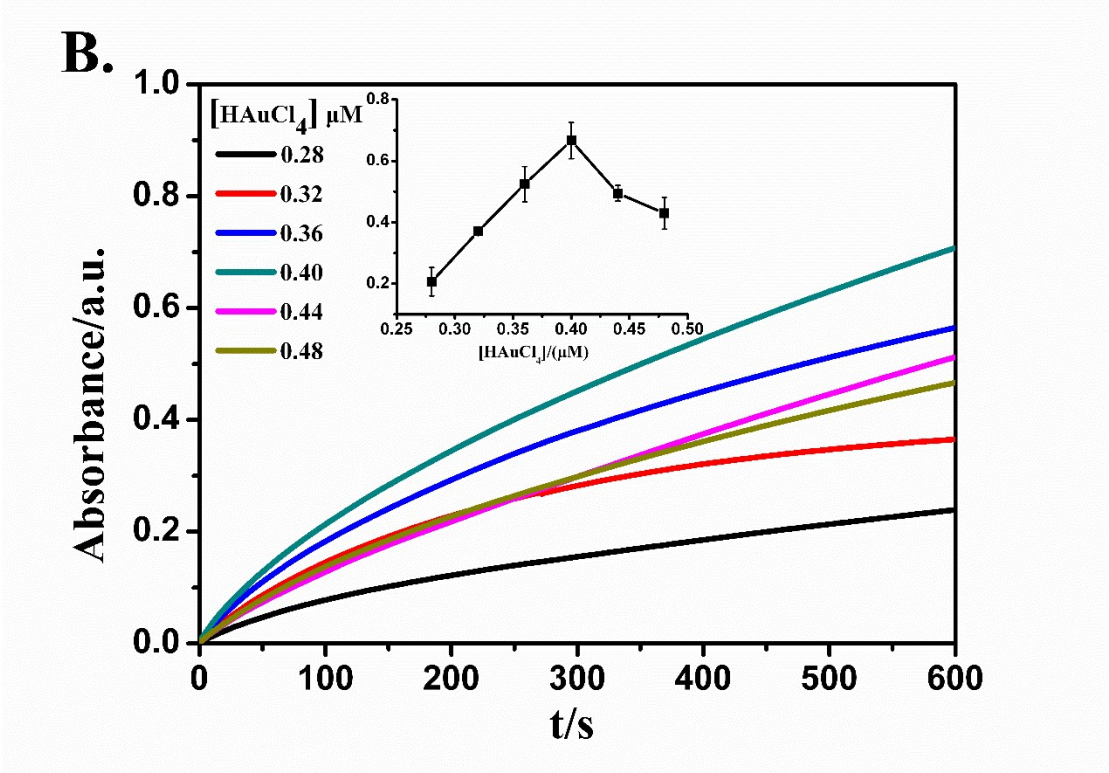




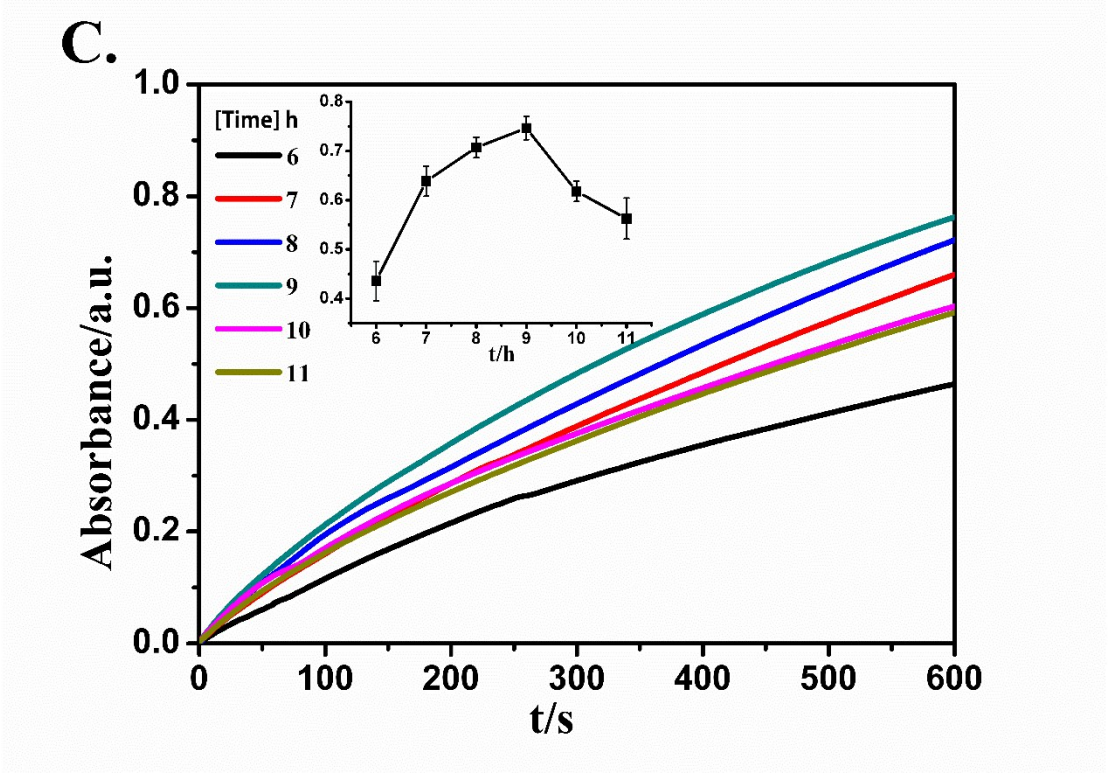
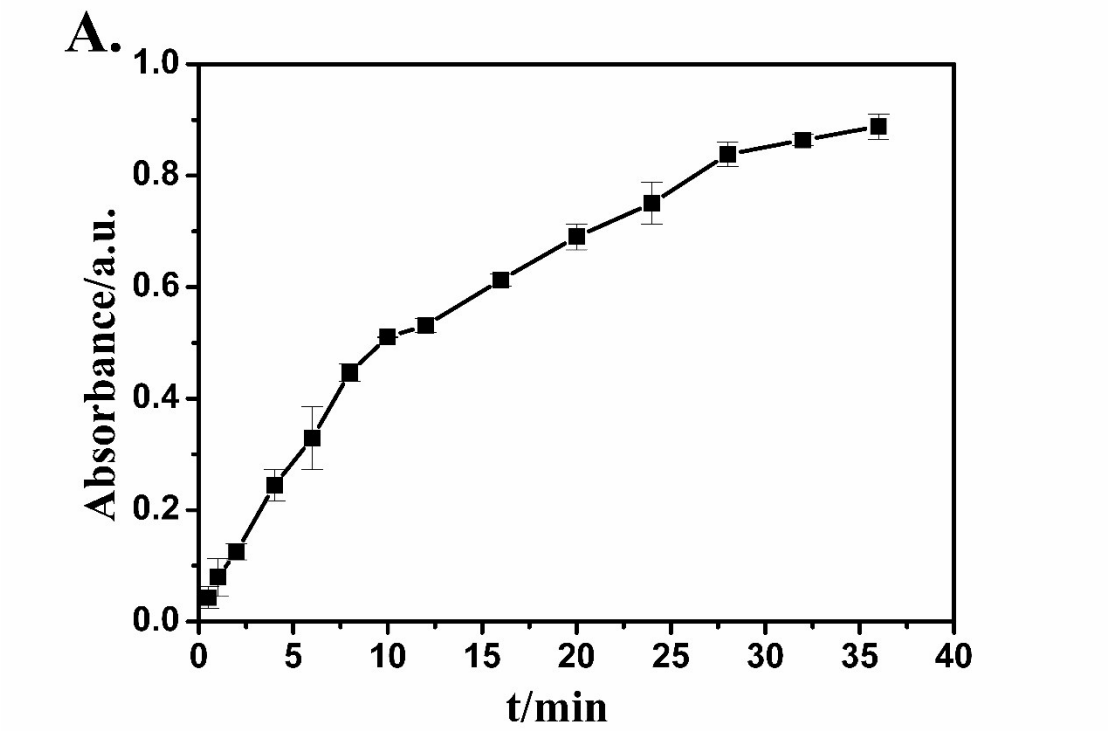
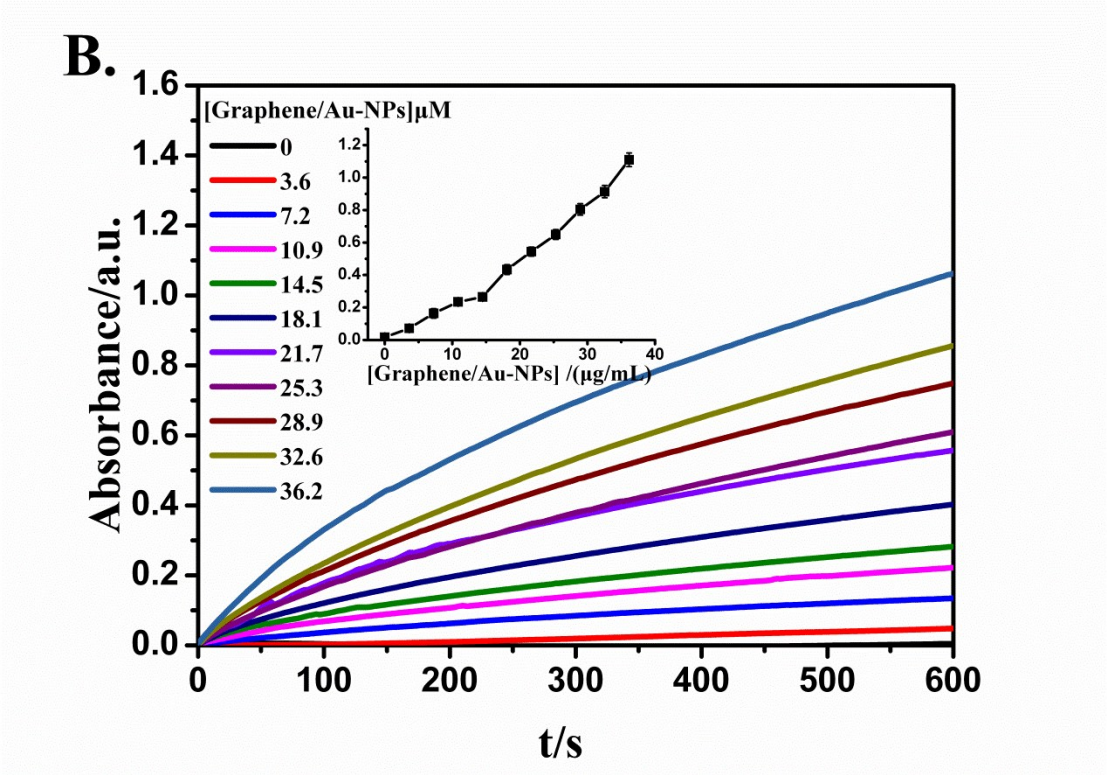
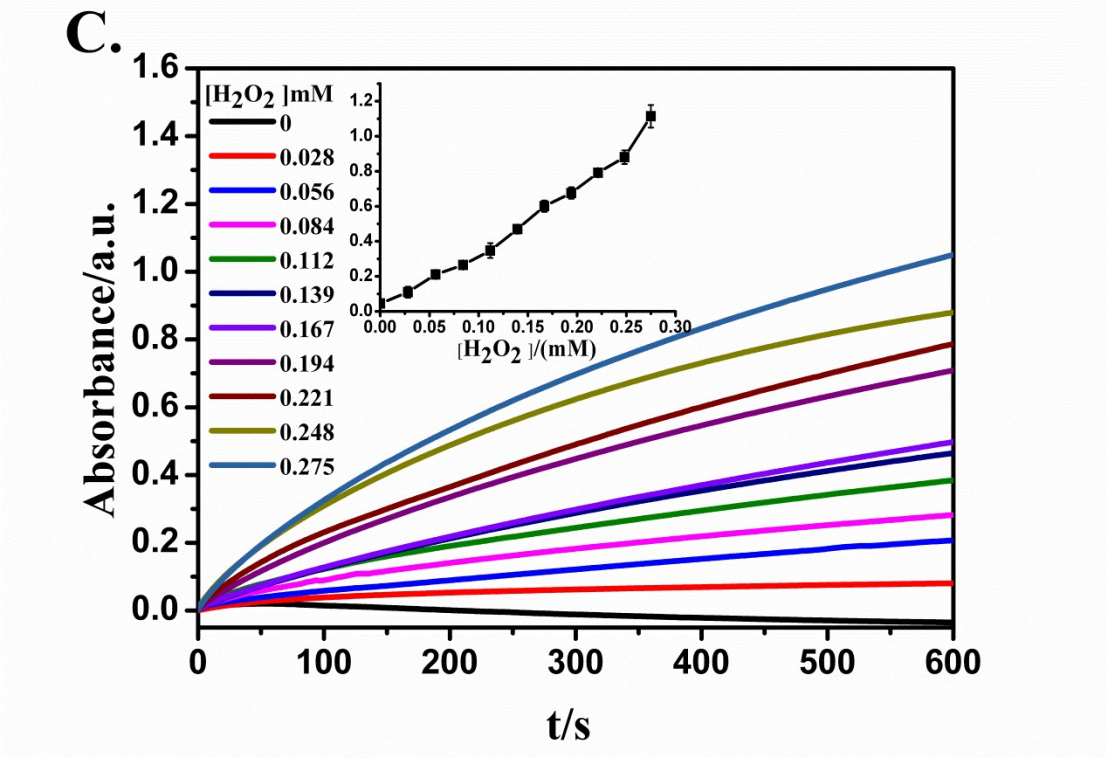


Fig. S1. Optimization of hydrothermal process parameters (A. pH, B. HAuCl4 concentration, C. reaction time)




B.
Absorbance/a.u.
t/s
[Graphene/Au-NPs]μM
0
3.6
7.2
10.9
14.5
18.1
21.7
25.3
28.9
32.6
36.2
[Graphene/Au-NPs] /(μg/mL)


C.
Absorbance/a.u.
t/s
[H2O2]mM
0
0.028
0.056
0.084
0.112
0.139
0.167
0.194
0.221
0.248
0.275
[H2O2]/(mM)

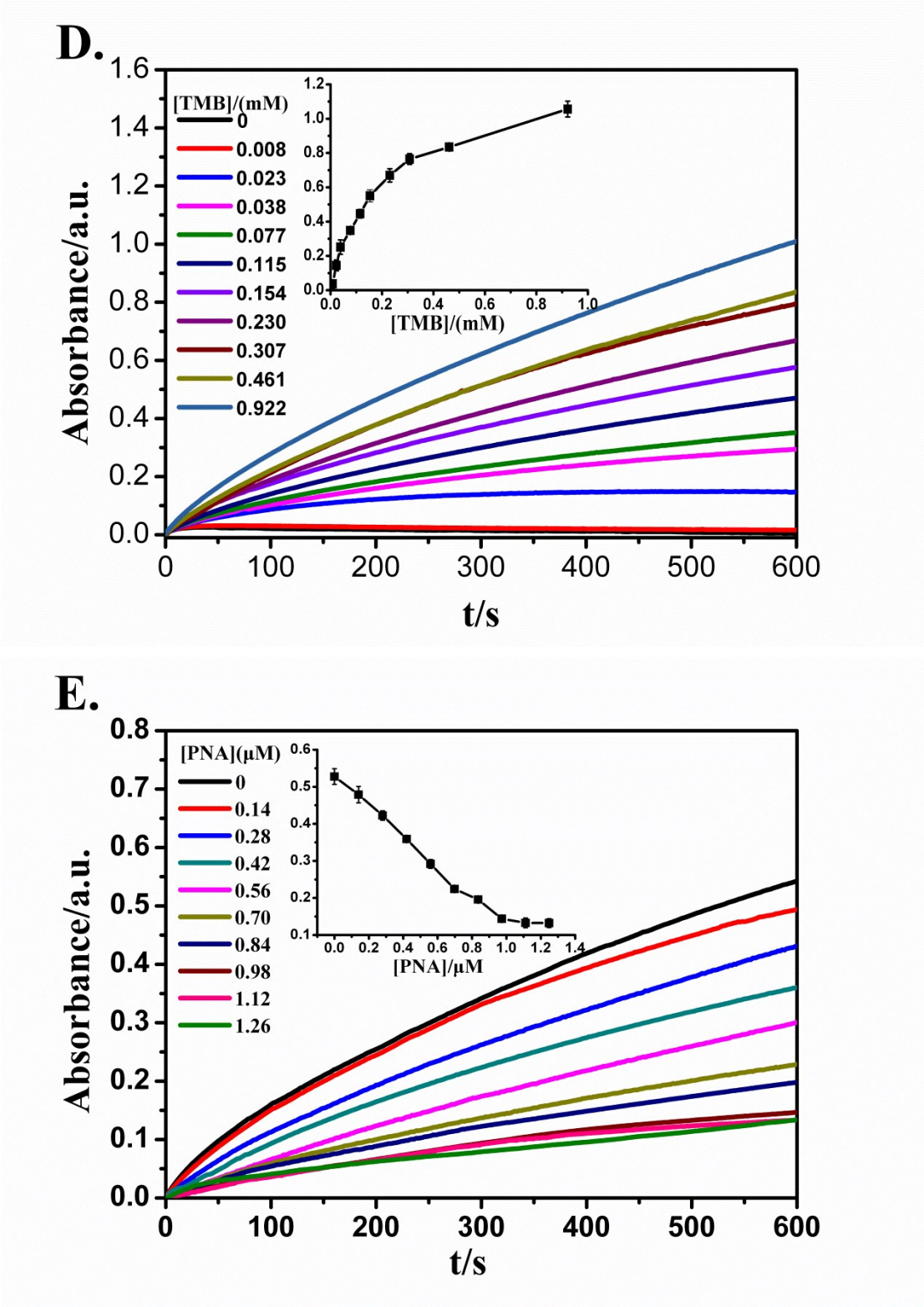


Fig. S2 Optimization of color developing progress parameters (A. color developing time, B. graphene/Au-NP hybrids, C. H_2O_2, D. TMB and E. PNA-21).

The details of miRNA-21 detection in human serum

The serum was thawed in room temperature and centrifuged at 3000 r/min for 5 min. The precipitate in the bottom was removed. Then, the serum was diluted 1:10 with ultrapure water. The diluted human serum was added with 140, 280, or 540 nM target miRNA to form artificial samples, in which the contents of target miRNA were detected by our biosensor. Firstly, 3.5 μL PNA-21 (100 μM) was incubated with standard addition sample containing the complementary miRNA-21 in the TE buffer (pH 8.0) for 16 cycles (1 min at 95 ^{o}C and 3 min at 25 ^{o}C) in PCR instrument. Then, 60 μL graphene/Au-NPs hybrids (0.13 mg/mL) were added into the solution and mildly shook 30 min at room temperature. Next, the system were added with 250 μL TMB (0.22 mM, diluted by 20.0 mM citrate buffer (pH 4.0)) and 6 μL H_2O_2 (9.9 M). Finally, the real-time absorbance at 652 nm was measured after 10 min.