Electronic Supplementary Information (ESI)

Experimental section

All chemicals used were analytical-reagent grade. 2-aminothiophnol (AT) (98%, Alfa Aesar), 2,4,6-trinitrotoluene (TNT) and 2,4-dinitrotoluene (DNT) were supplied by National Security Department of China, Toluene, nitro benzene (NB), nitro phenol (NP), chloroauric acidtetrahydrate ($AuCl_3 \cdot HCl \cdot 4H_2O$), trisodium citrate dehydrate ($C_6H_5Na_3O_7 \cdot 2H_2O$), sodium dodecylsulfate (SDS) and $(NH_4)_2S_2O_8$ were purchased from Shanghai Chemical Reagent Ltd. Co. of China. All solutions were prepared using ultrapure water (resistance > 18 MΩ cm^{-1}).

In a typical experimental procedure, citrate-stabilized Au NPs (citrate-Au NPs) solution (100 ml) was concentrated to a total of 2 ml. After removal of supernatant, the Au NPs were added to a mixture of SDS (12.85 mM, 40 ml, 0.148 g, $5.14*10^{-4}$ mol) and 2-aminothiophnol (1.168 mM, 5 ml, $4.67*10^{-5}$ mol). Then the solution was stirred for 30min followed by addition of $(NH_4)_2S_2O_8$ solution (0.125 M, 1 ml) at 70 ^{o}C. Then the reaction mixture was incubated at 70 ^{o}C for 2h to ensure complete polymerization. The pH of the solution was 2.45 after completing polymerization. To isolate Au@PAT, the reaction mixture was centrifuged and the concentrated NP solution was collected at the bottom of the centrifuge tube which can be further purified by centrifugation. After three times purified by centrifugation, the pH of the Au@PAT solution was 6.86.

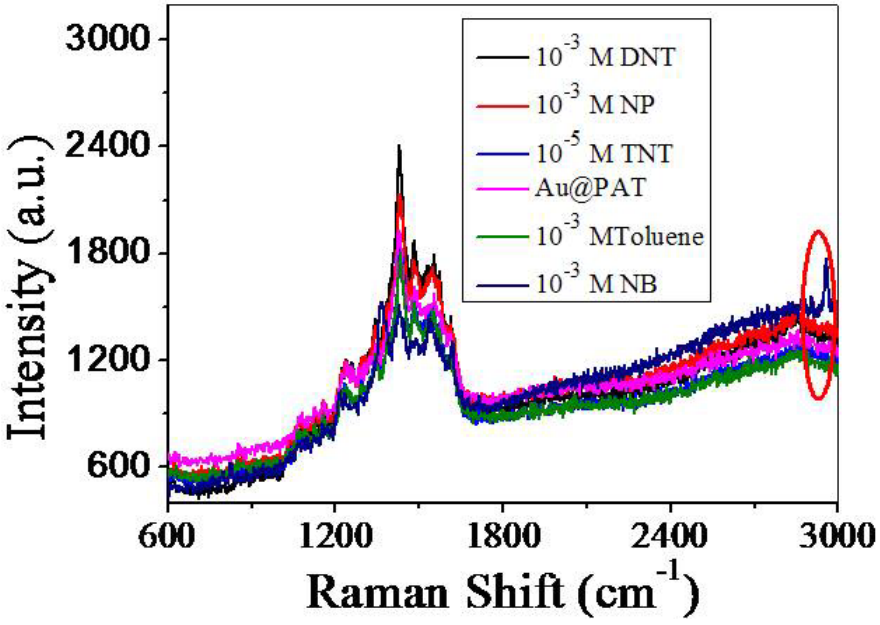

Figure S1. Plot demonstrating SERS spectra in the presence of TNT (10^{-5} M), DDT, NP, NB and Toluene(10^{-3} M).