Electronic Supplementary Material (ESI) for Analytical Methods.
This journal is © The Royal Society of Chemistry 2015

Supporting Information

An Ultrasensitive and Selective Turn-Off Fluorescent Nanoprobe for the Detection of Copper Ions

M.RezaHormozi-Nezhad*[1,2], M. Taghipour

1) *Department of Chemistry, Sharif University of Technology, Tehran, 11155-9516, Iran*

2)Institute for Nanoscience and Nanotechnology, Sharif University of Technology,

Tehran, P.O. Box 11365-9161, Iran

* Corresponding author at: Department of Chemistry, Sharif University of Technology

Tel.: +98 2166165337;Fax: +98 2166029165

E-mail addresses: hormozi@sharif.edu

In order to obtain the highest detection efficiency of the prepared FRET-based sensor, FITC concentration optimization was one of the parameters to be optimized. Therefore, the effect of FITC concentration was studied in the range of0-1.75 μM on the fluorescence intensity of AuNPs-FITC in the presence (A) and absence (B) of D-PC (Fig. S 1). The optimal concentration of FITC is crucial to saturate the surface of AuNPs, while remaining almost no free FITC in the solution. The results demonstrated that the fluorescence intensity rises drastically upon increase in concentration of FITC above 1.25 μM. This can be ascribed to the presence of free FITC molecules more than what is required for the saturation of AuNPs. Additionally, the fluorescence intensity was quenched at concentrations below to the 1 μM, indicating all of FITC molecules were loaded on AuNPs surface and perhaps there are some vacant spots on AuNPs surface. These free spots, later can be capped by D-PC without releasing any FITC molecule. Thus, the concentration of 1 μM was chosen as the optimum concentration of FITC for next experiments.

Time was another parameter that was investigated for each step. Initially the time needed for formation of probe was studied. As shown in Fig. S 2 (B), after 5 min, the probe fluorescence is at lowest intensity and totally stable. Therefore, 5 min was chosen as the optimized time for next experiments. After addition of D-PC and copper complex solution to the probe solution, as shown in Fig S 2 (B), incubation time is only 25 min to reach the highest fluorescence intensity which means the highest release of FITC by D-PC. Then, 25 min was chosen as the optimized time for next experiments.

Table 1 shows a quick comparison between the current proposed method and two other methods [1-2].

Legend of figures:

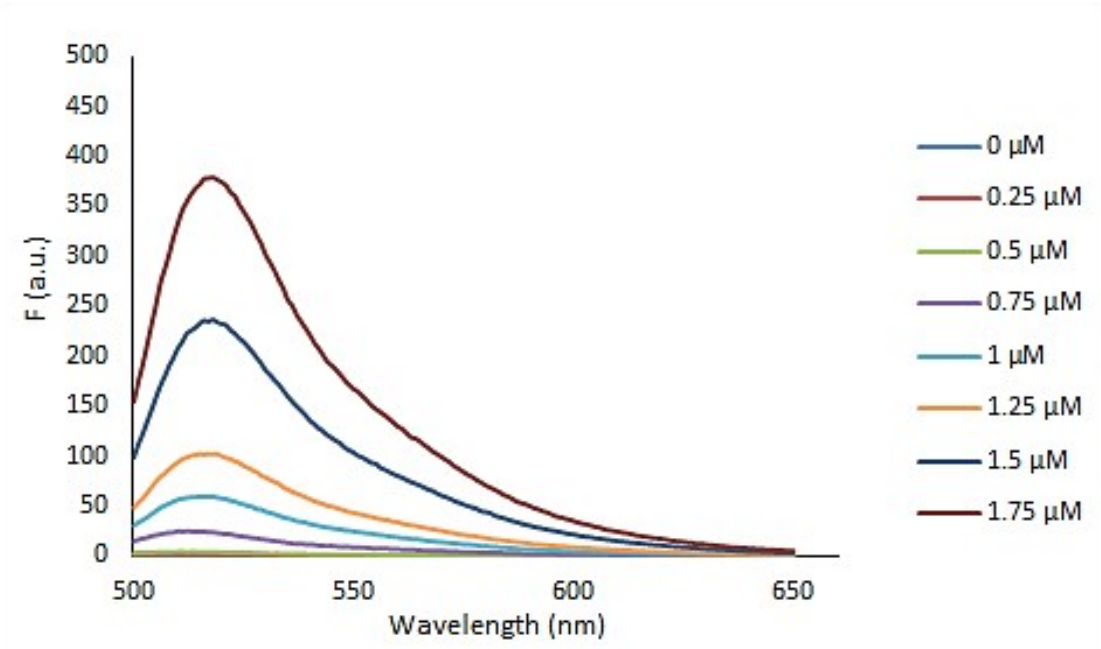
Figure S 1. Effect of FITC on the fluorescence intensity in the presence of 1.5 nMAuNPsat pH=8. (A) At the absence of D-PA (Blank) and (B) In the presence of 8.5 µM D-PA (Sample)

Figure S 2. Optimization oftime. (A) Formation of AuNP-FITC probe at concentrations of 1.5 nM and 1 µM, respectively and (B) Incubation time of probe and complex (D-PC and copper).

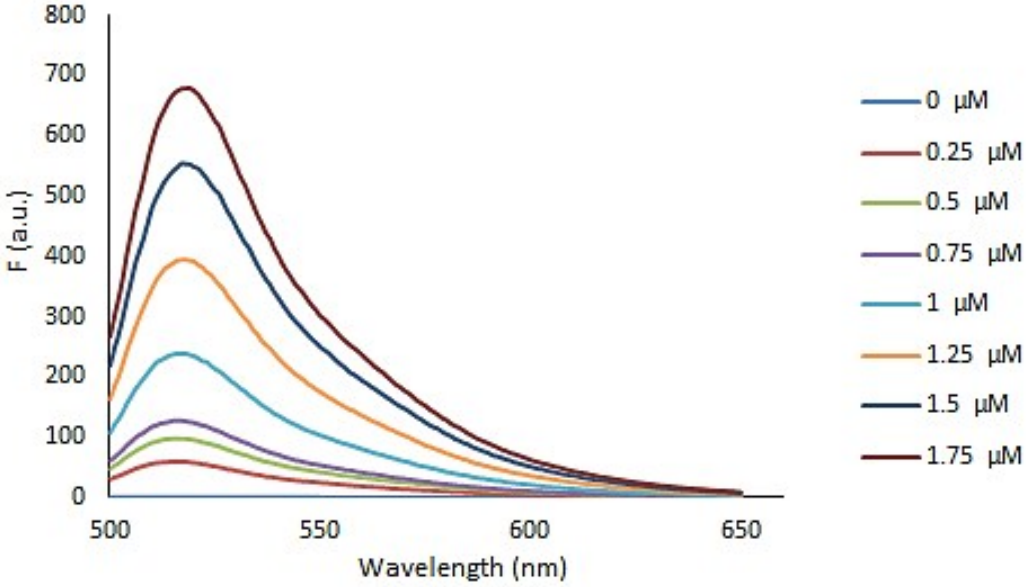
Figure S 3. Chemical structure of (A) D-Penicillamine, (B) Copper and D-penicillamine complex[3]

Table S 1. Comparison of the figures of merit between current method, ICP and AAS.

Figure S 1


500
450
400
350
300
250
200
150
100
50
0
F (a.u.)
500
550
600
650
Wavelength (nm)
0 µM
0.25 µM
0.5 µM
0.75 µM
1 µM
1.25 µM
1.5 µM
1.75 µM

(A)


800
700
600
500
400
300
200
100
0
F (a.u.)
500
550
600
650
Wavelength (nm)
0 µM
0.25 µM
0.5 µM
0.75 µM
1 µM
1.25 µM
1.5 µM
1.75 µM

(B)

Figure S 2

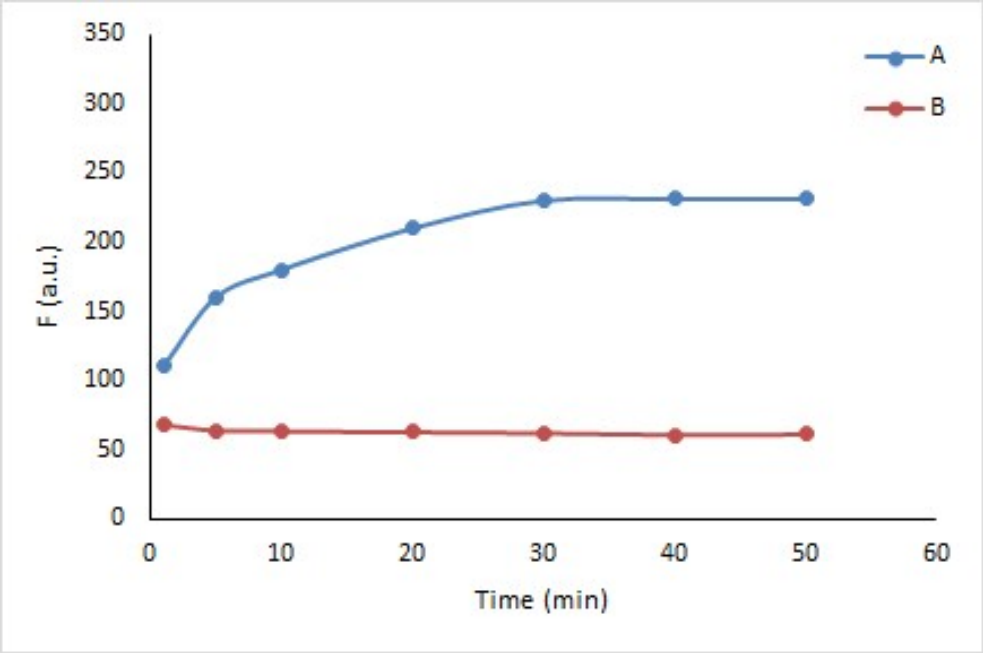
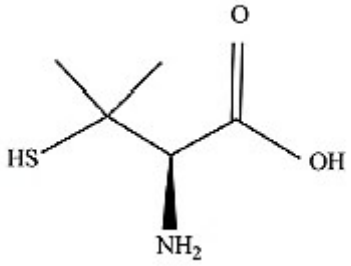


Figure S 3



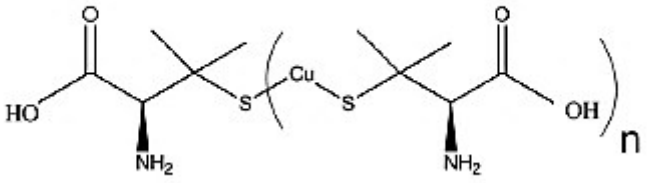


Table 1

Method	LOD (nM)	LOQ (nM)
AAS (Flame)	153.3	46.0
ICP	26.7	8.0
Current Method	0.3	0.3

Reference:

(1) D. M. Simpson, R. J. Beynon, D. H. L. Robertson, M. J. Loughran, S. Haywood, Proteomics,2004, 4*,* 524–536.

(2) M. Tuzen, *Microchem. J*., 2003, 74, 289–297.

(3) D. Evered, G. Lawrenson (Ed.), Ciba Foundation Symposium 79—Biological Roles of Copper, John Wiley & Sons, 1980, pp. 293-300.

(4) A. Gergely, I. Sovago, *Bioinorg*. *Chem*. 1978, 9, 47–60.