Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information

Highly sensitive colorimetric and naked-eye detection of Arsenic (III) using paper-based microfluidic device decorated with silver nanoparticles

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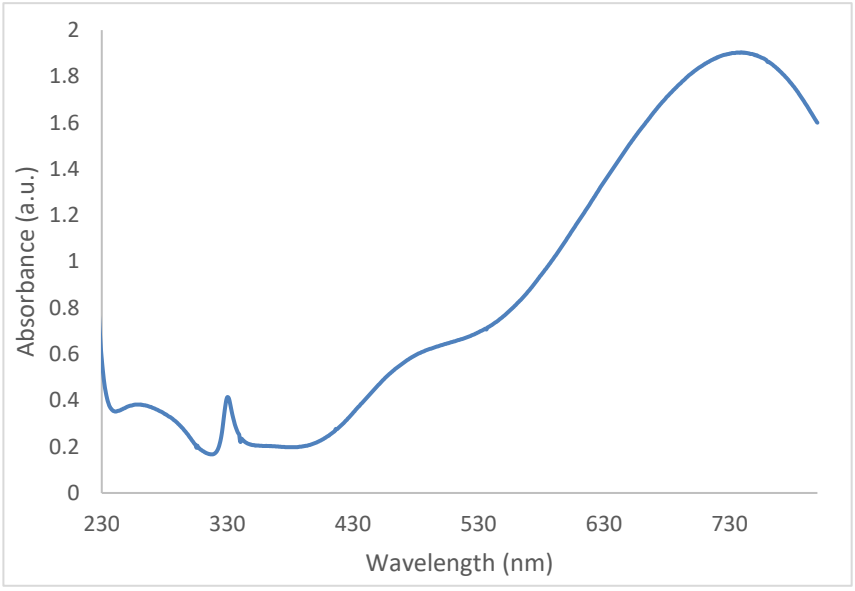


Figure S1. *UV-Vis absorbance spectrum of Ag nanoprism.*

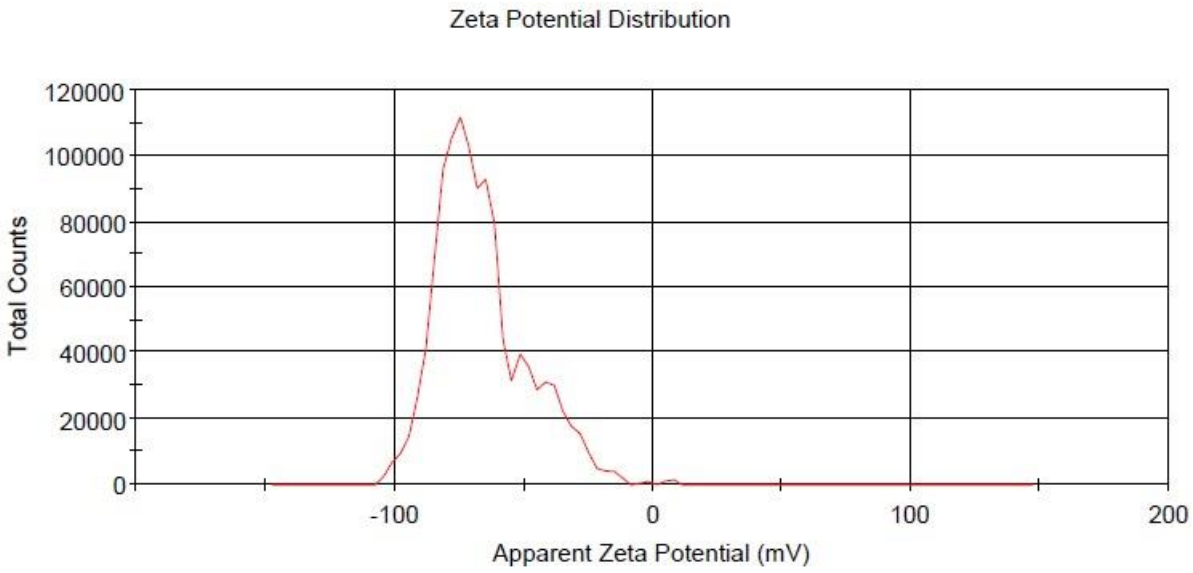


Figure S2. *Zeta potential of Ag nanoprism.*

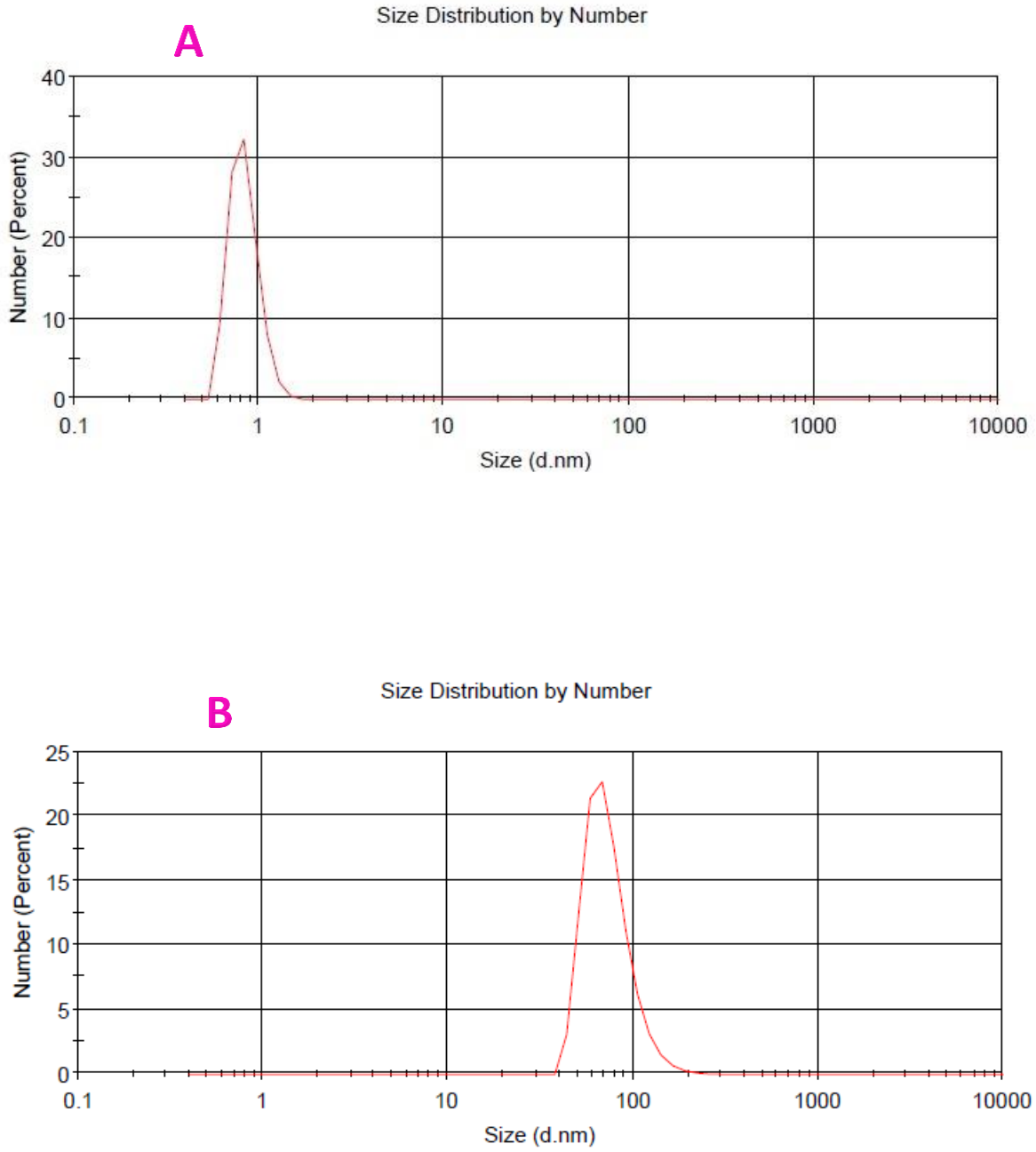


Figure S3. *Dynamic light scattering (DLS) analysis of* ***A)*** *Ag NPrs,* ***B)*** *Ag NPrs after interaction with arsenic.*

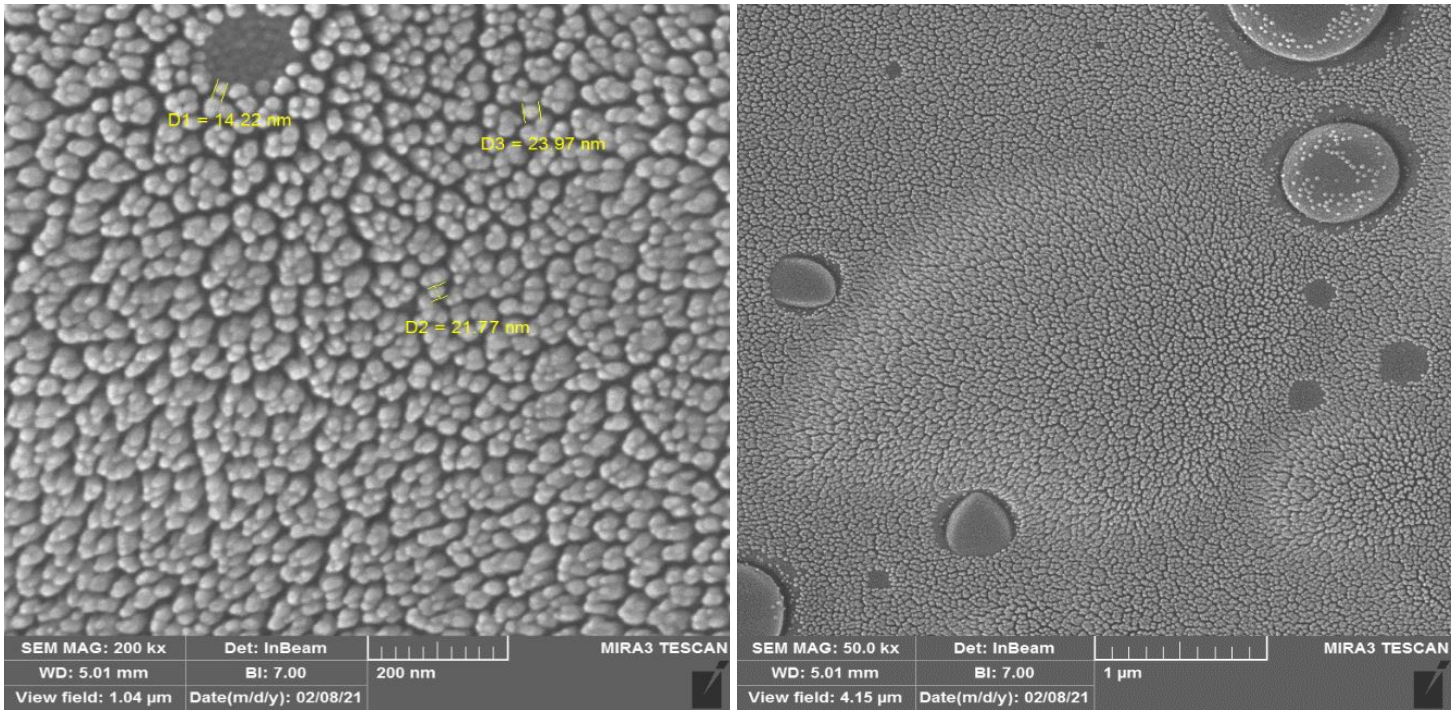


Figure S4. *FE-SEM images of Ag NPrs in two magnifications.*

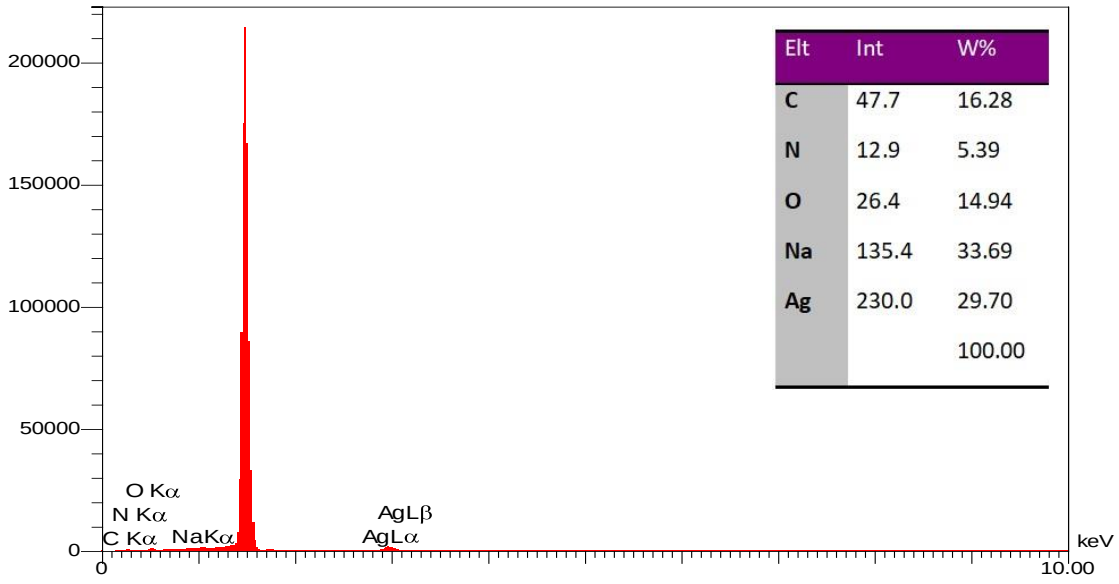


Figure S5. *EDS spectra of Ag NPrs.*

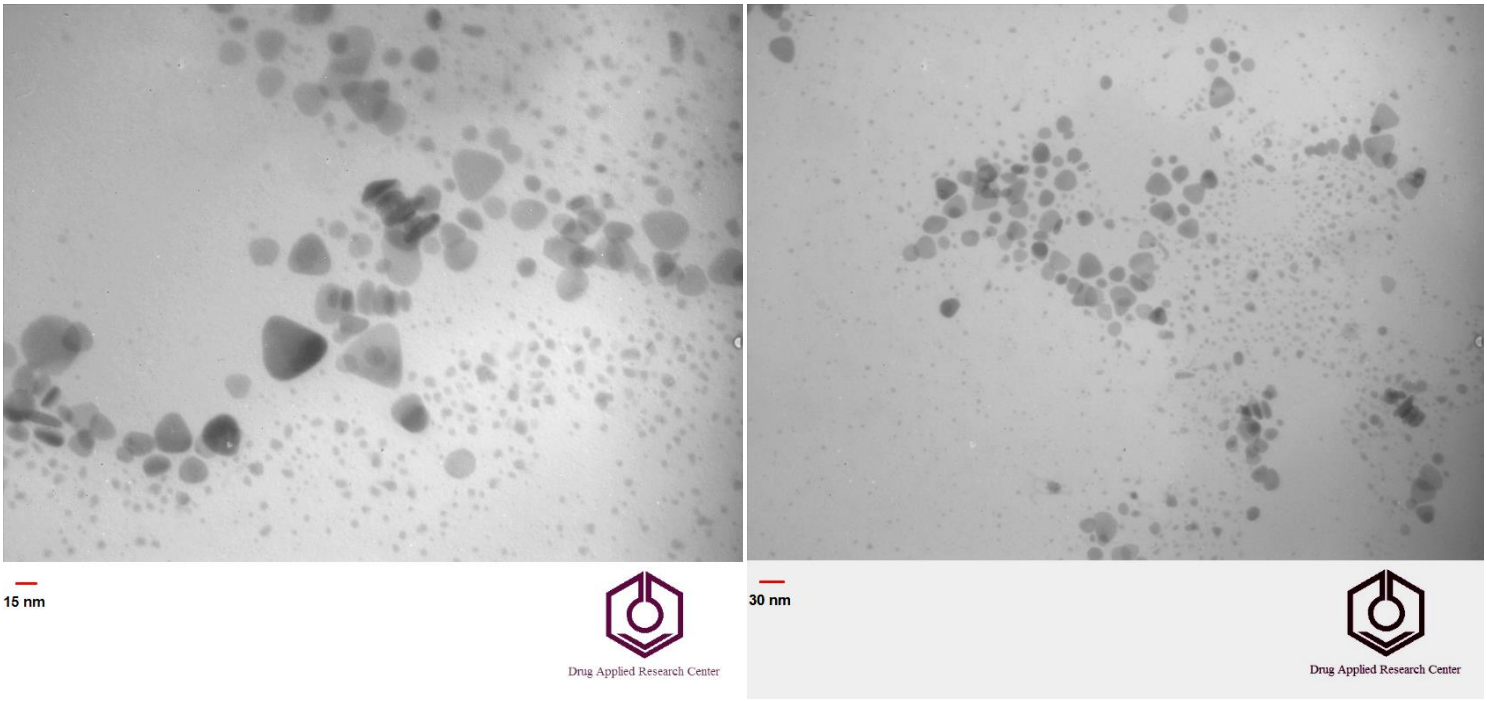


Figure S6. *HR-TEM images of Ag Ag NPrs in two magnifications.*

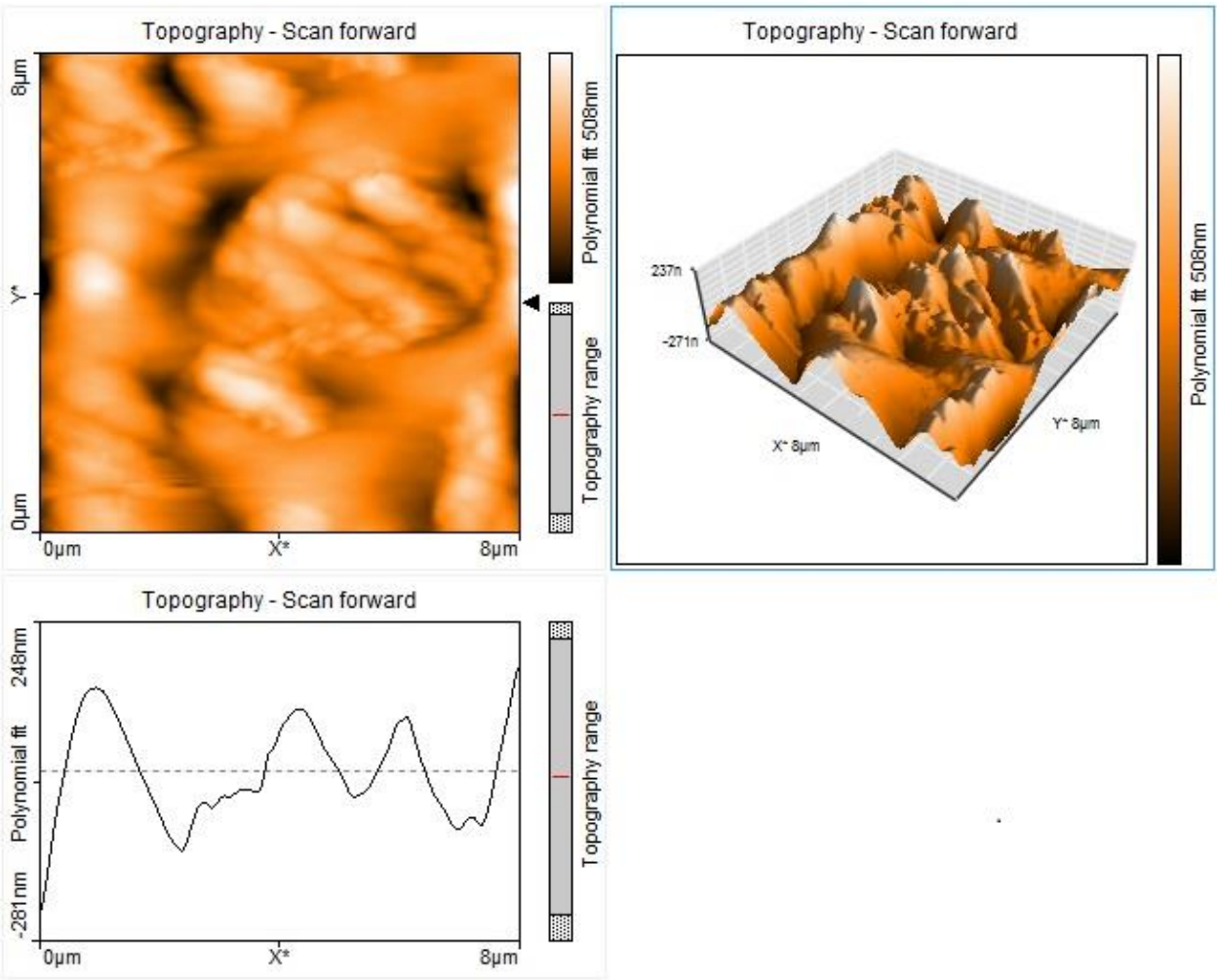


Figure S7. *Topographic AFM images of Ag NPrs.*

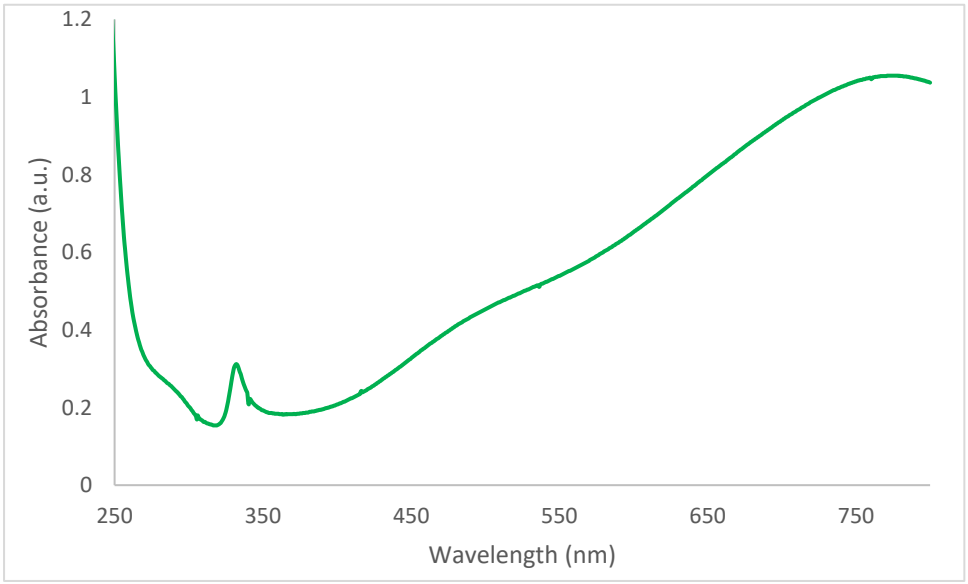


Figure S8. *UV-Vis absorbance spectrum of Cys-capped Ag NPrs.*

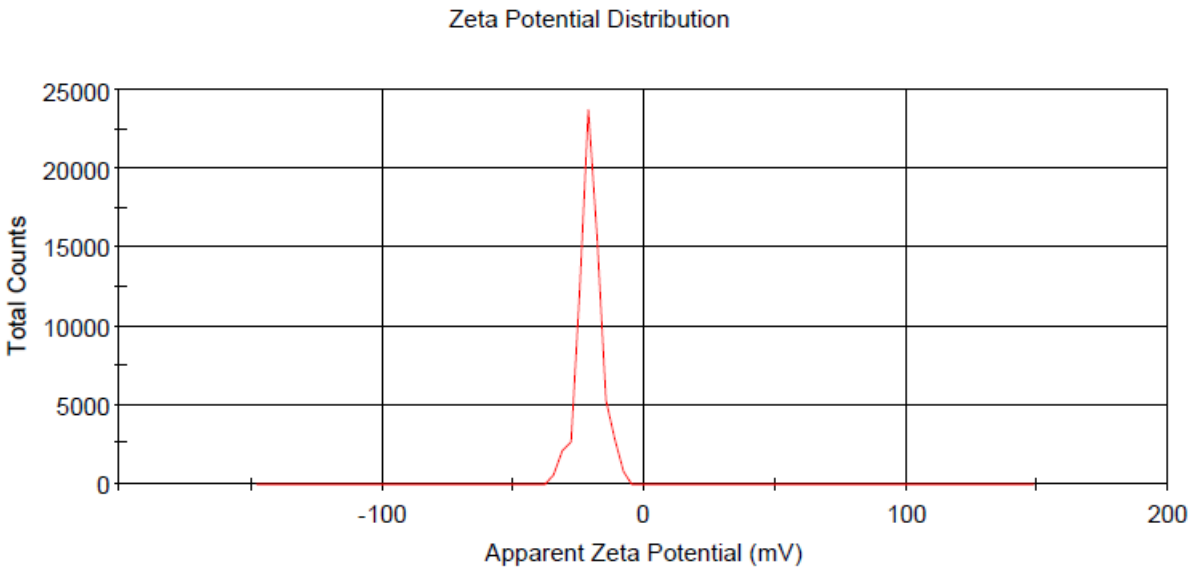
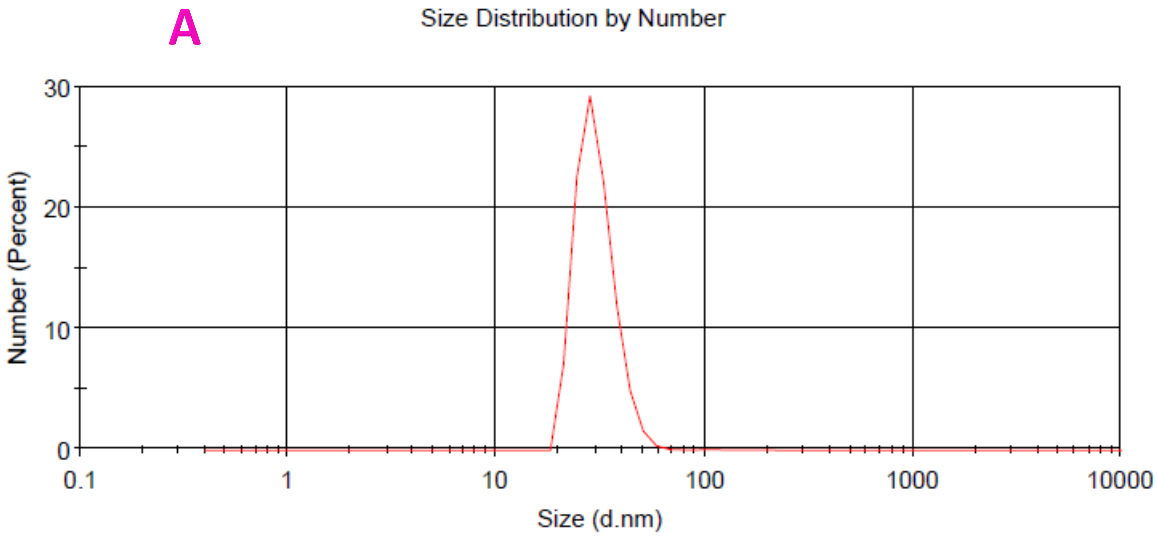


Figure S9. *Zeta potential of Cys-capped Ag NPrs.*



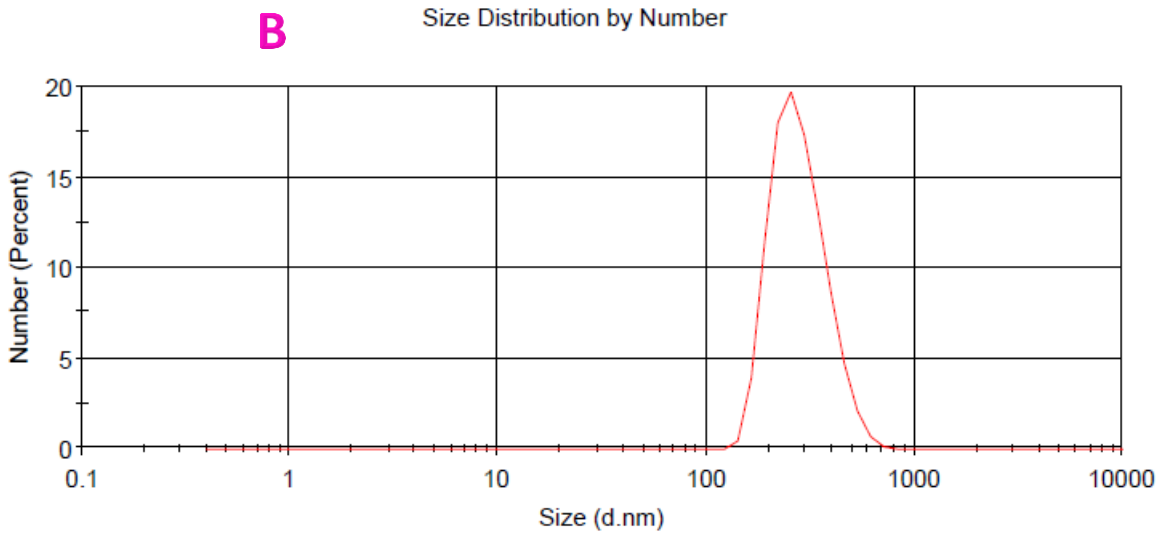


Figure S10. *Dynamic light scattering (DLS) analysis of* ***A)*** *Cys-capped Ag NPrs,* ***B)*** *Cys-capped Ag NPrs after interaction with As (III).*

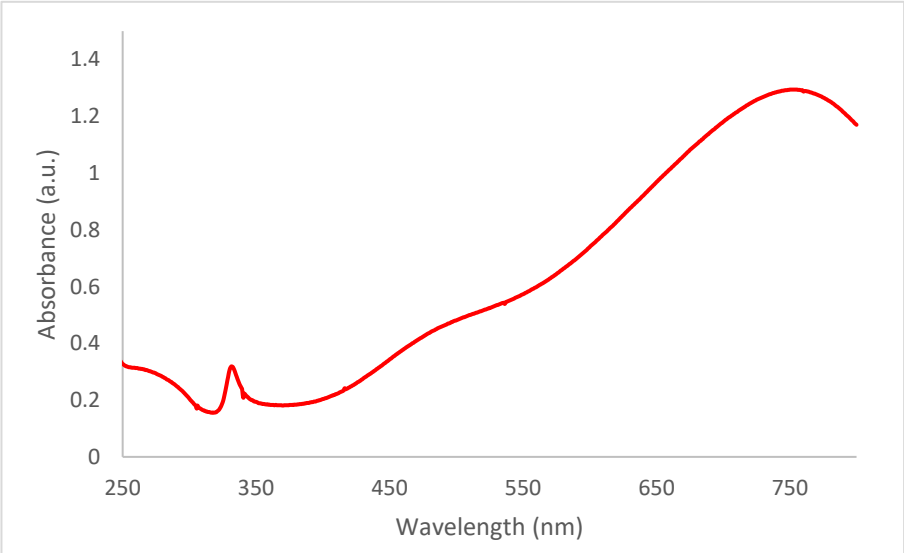


Figure S11. *UV-Vis absorbance spectrum of Met-capped Ag NPrs*

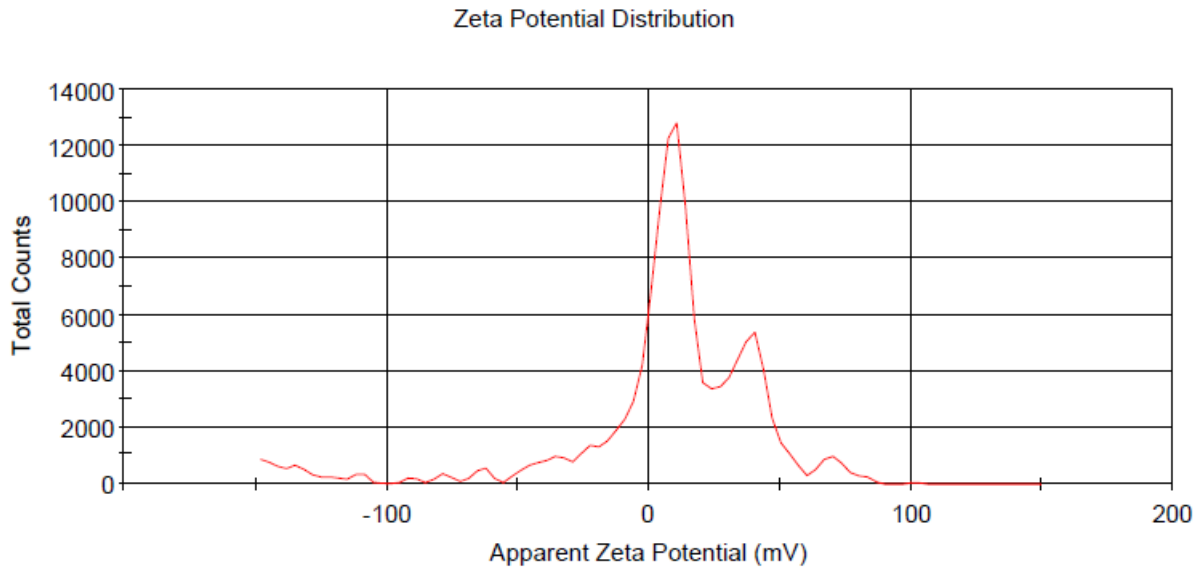


Figure S12. *Zeta potential of Met-capped Ag NPrs.*

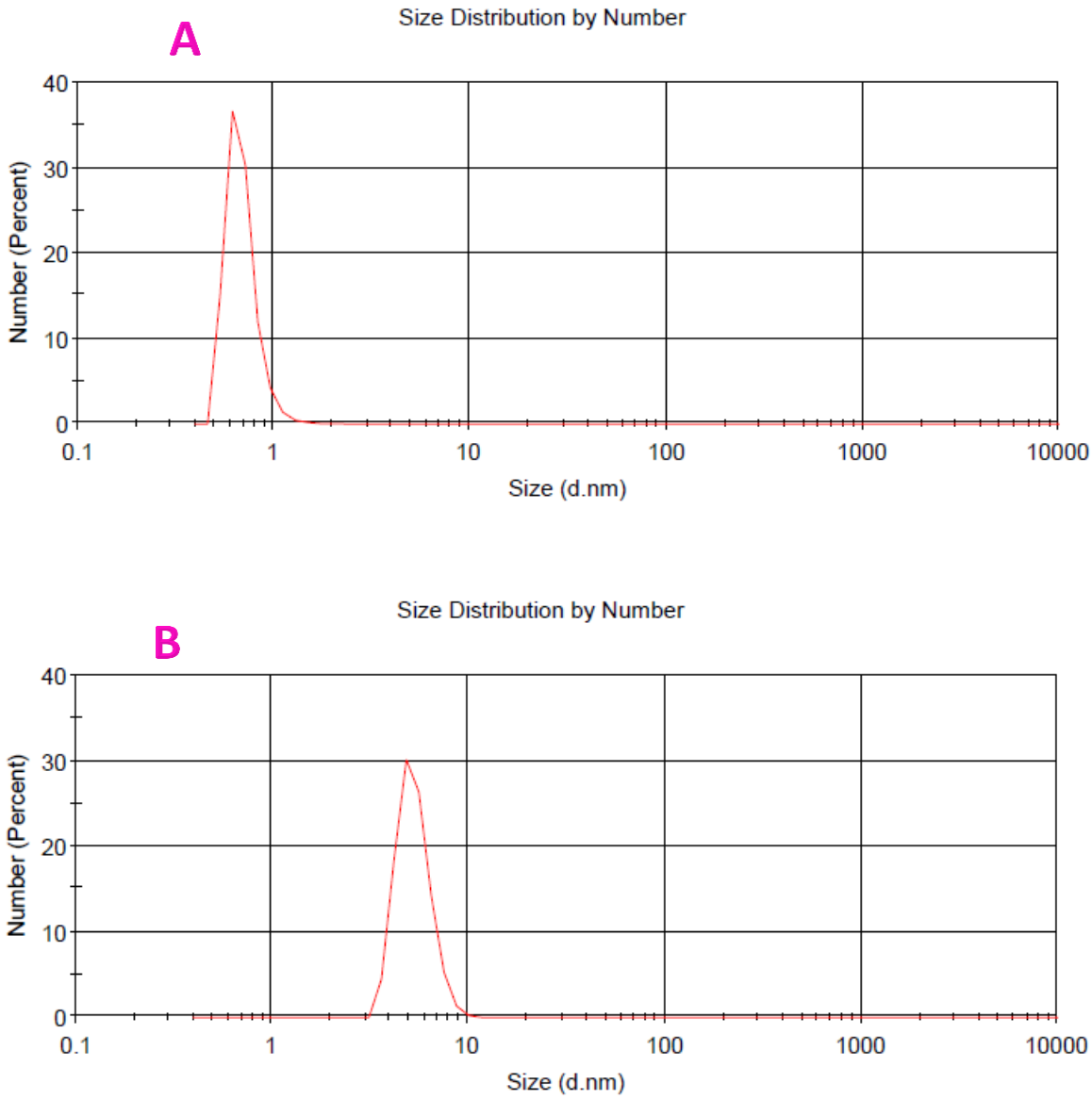


Figure S13. *Dynamic light scattering (DLS) analysis of* ***A)*** *Met-capped Ag NPrs,* ***B)*** *Met-capped Ag NPrs after interaction with As (III).*

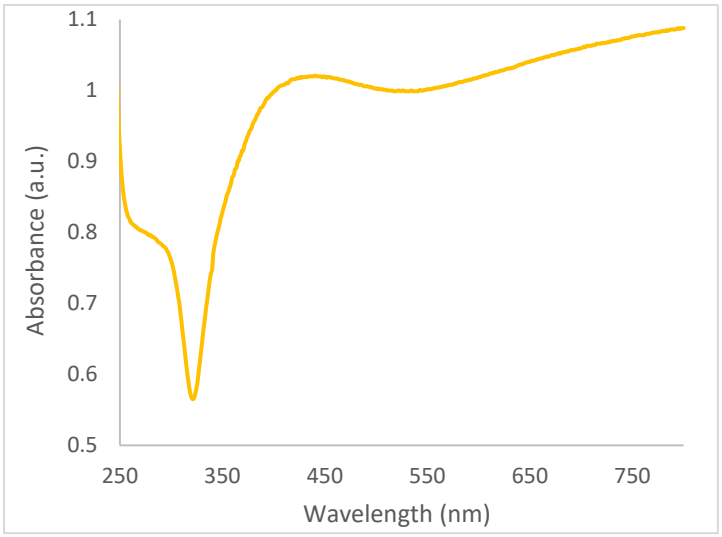


Figure S14. *UV-Vis absorbance spectrum of Ag NWs.*

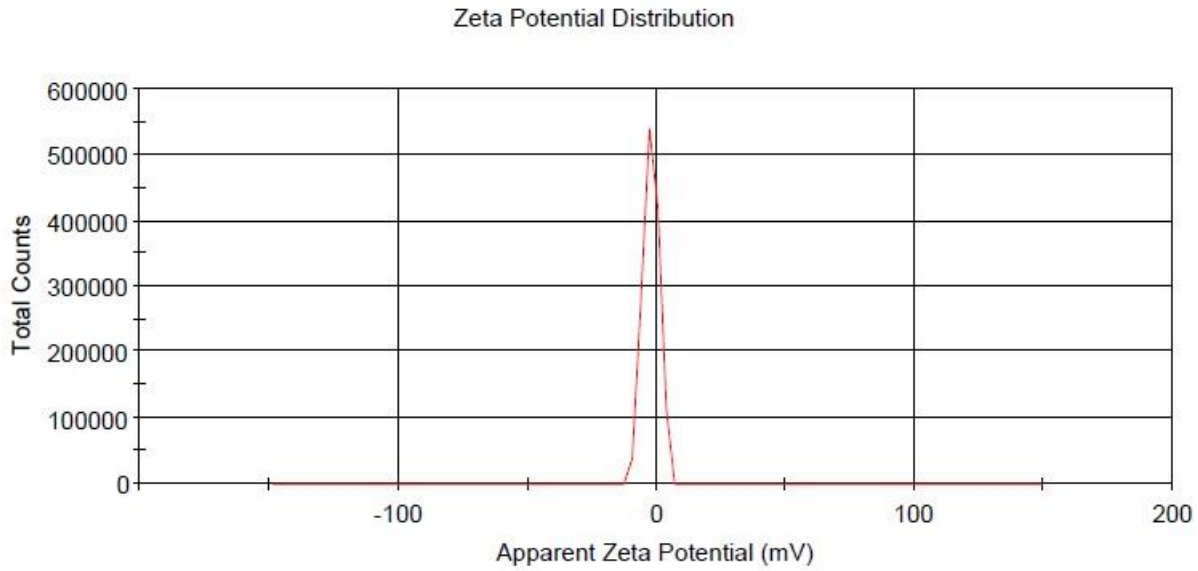


Figure S15. *Zeta potential of Ag NWs.*

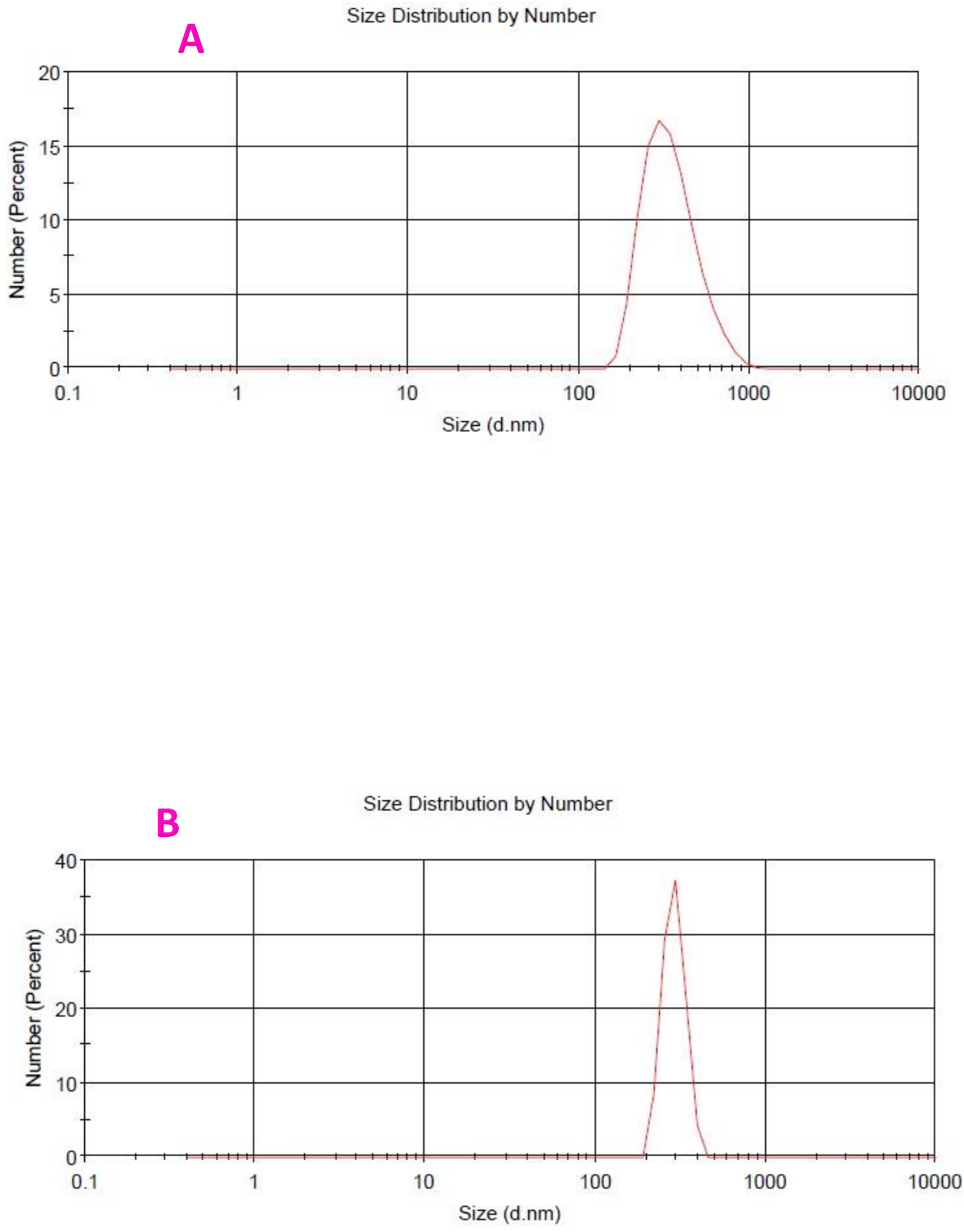


Figure S16. *Dynamic light scattering (DLS) analysis of* ***A)*** *Ag NWs,* ***B)*** *Ag NWs after interaction with As (III).*

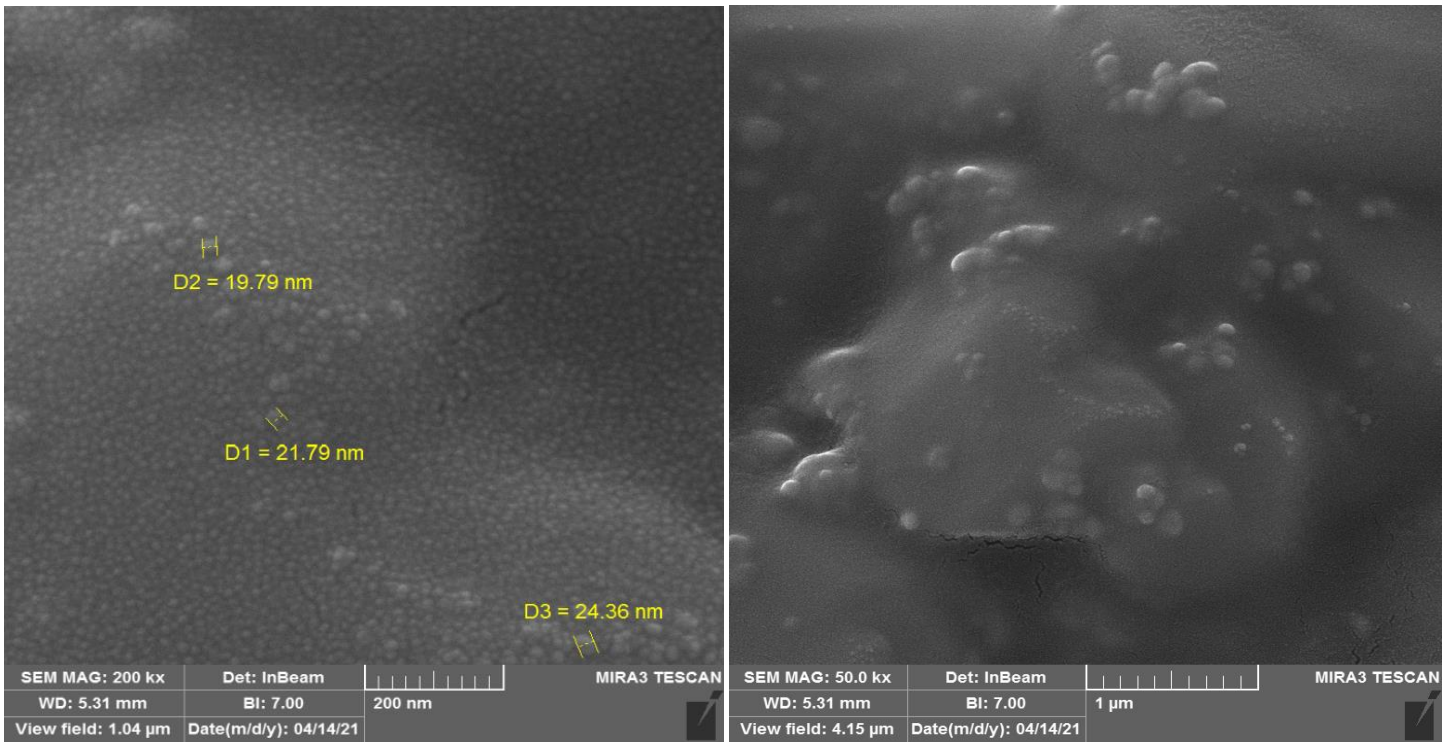


Figure S17. *FE-SEM images of Ag NWs in two magnifications.*

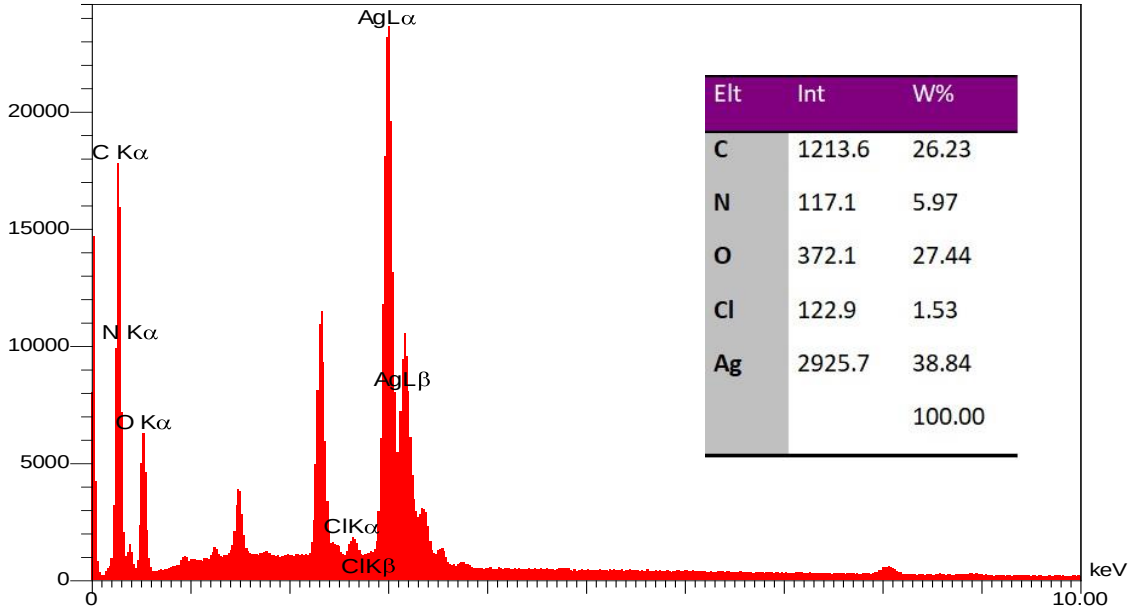


Figure S18. *EDS spectra of Ag NWs.*

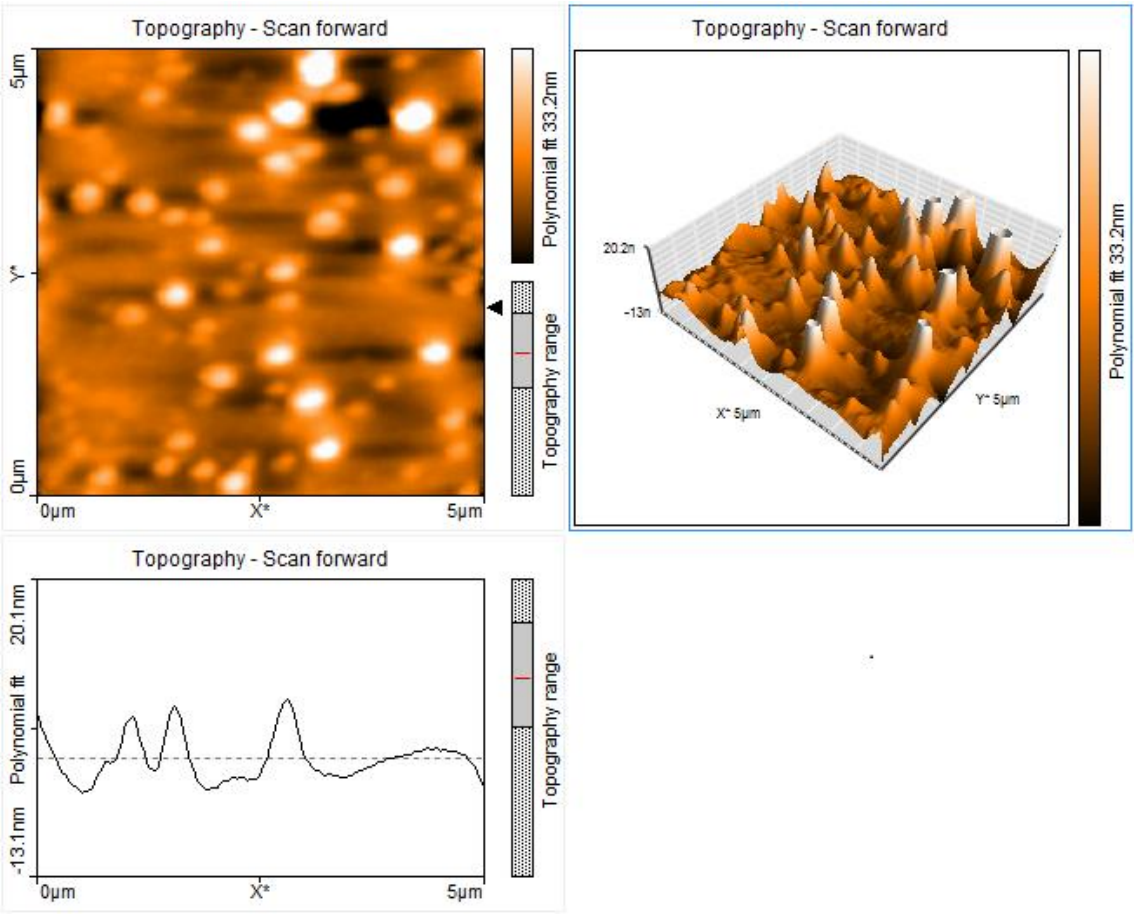


Figure S19. *Topographic AFM images of Ag NWs.*

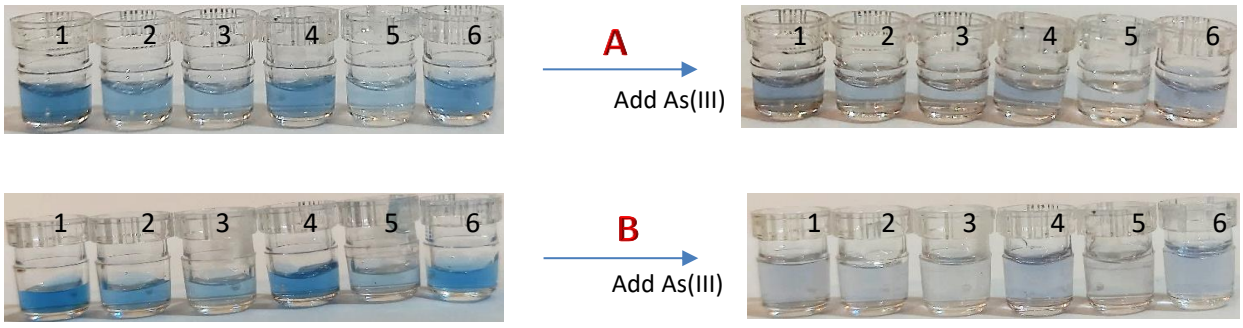
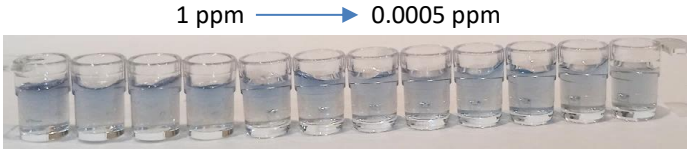
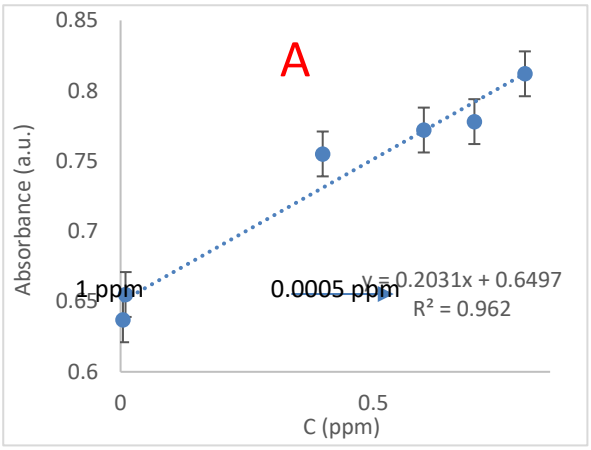
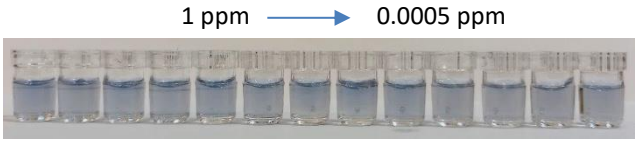
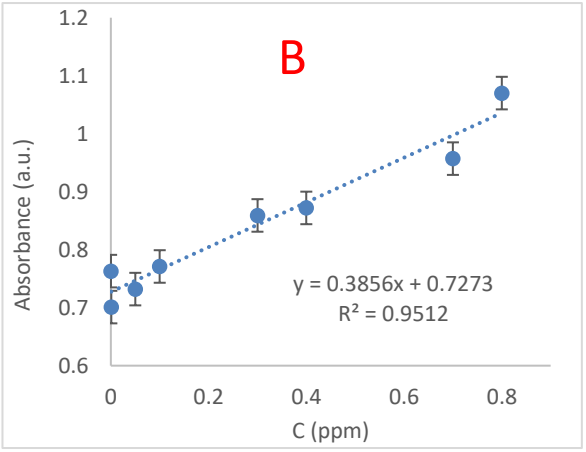


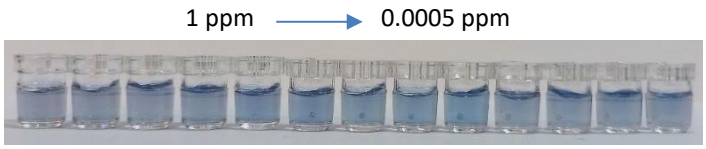
Figure S20. *Optimization of additive-probe volume ratio,* ***A)*** *additive-cysteine and* ***B)*** *additive-methionine-1 to 6, including Ag NPrs, 1: 1, 1: 2, 2: 1, 1:3 and 3:1 ratio of Ag NPrs and additive, respectively.*

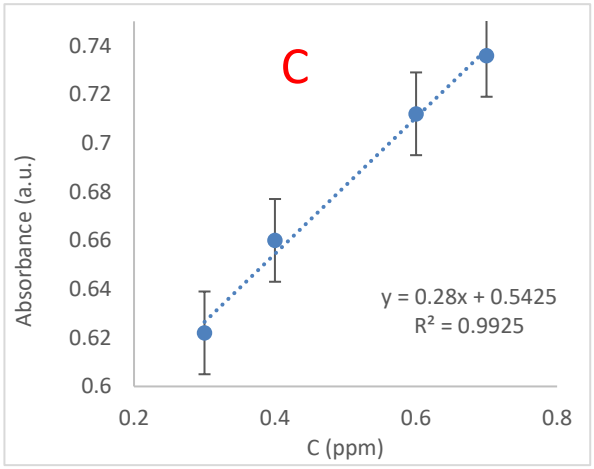












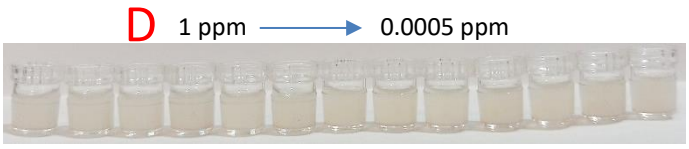
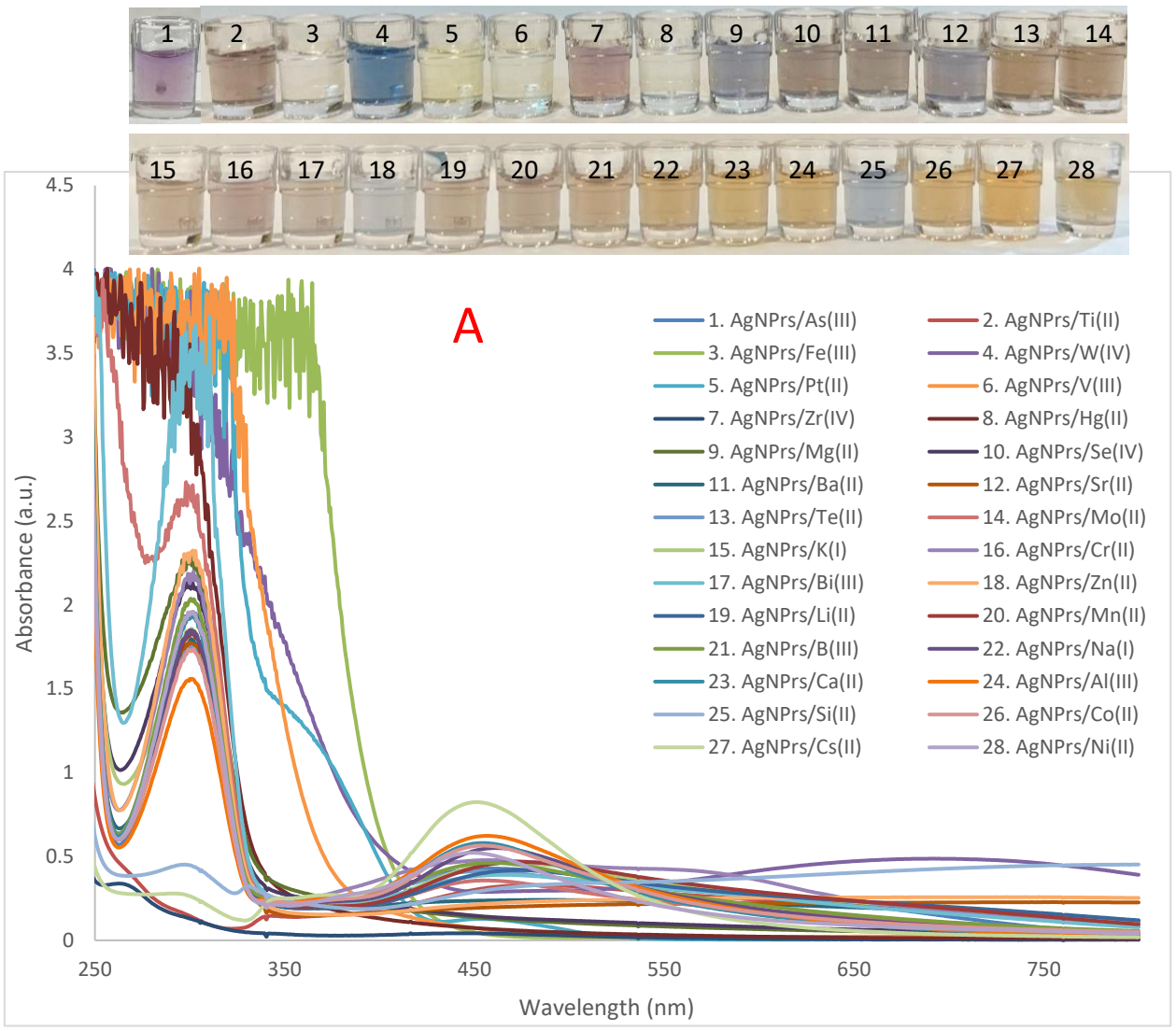


Figure S21. *Colorimetric assay and calibration curves extracted from UV-Vis spectra using AgNPrs* ***(A)****, Cys-capped AgNPrs* ***(B)****, Met-capped AgNPrs* ***(C)*** *and AgNWs* ***(D)*** *(just colorimetric assay) sensing probes in the presence of different concentrations of arsenic in human urine samples by Spike method (0.0005, 0.001, 0.005, 0.01, 0.05, 0.1, 0.2, 0.3, 0.4, 0.6, 0.7, 0.8 and 1 ppm).*


1
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11
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16
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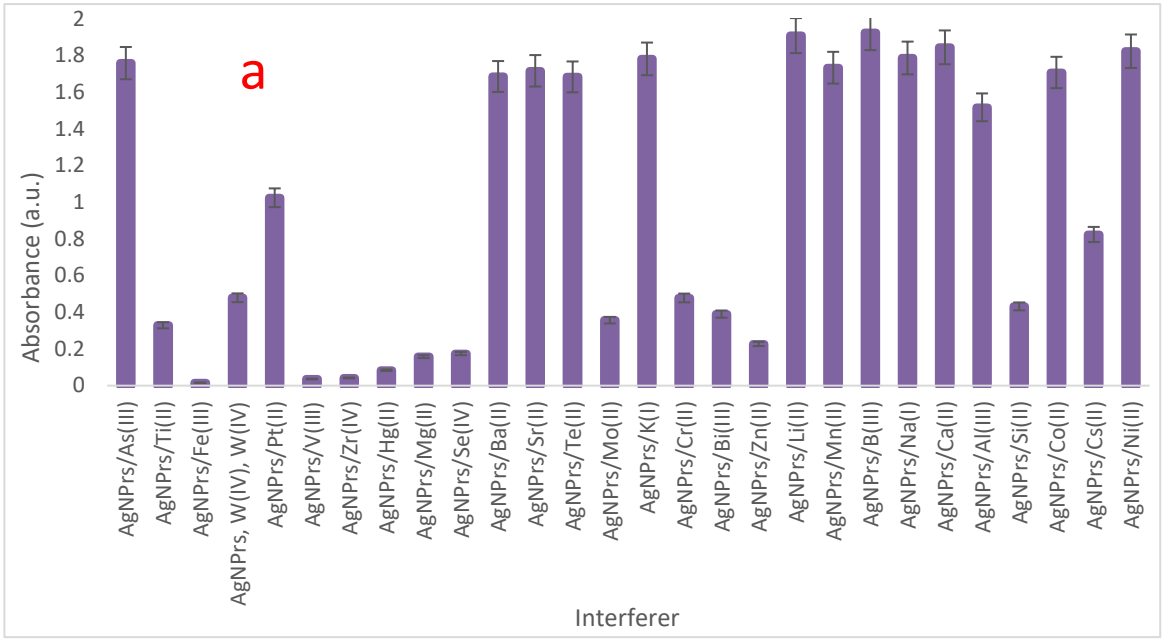
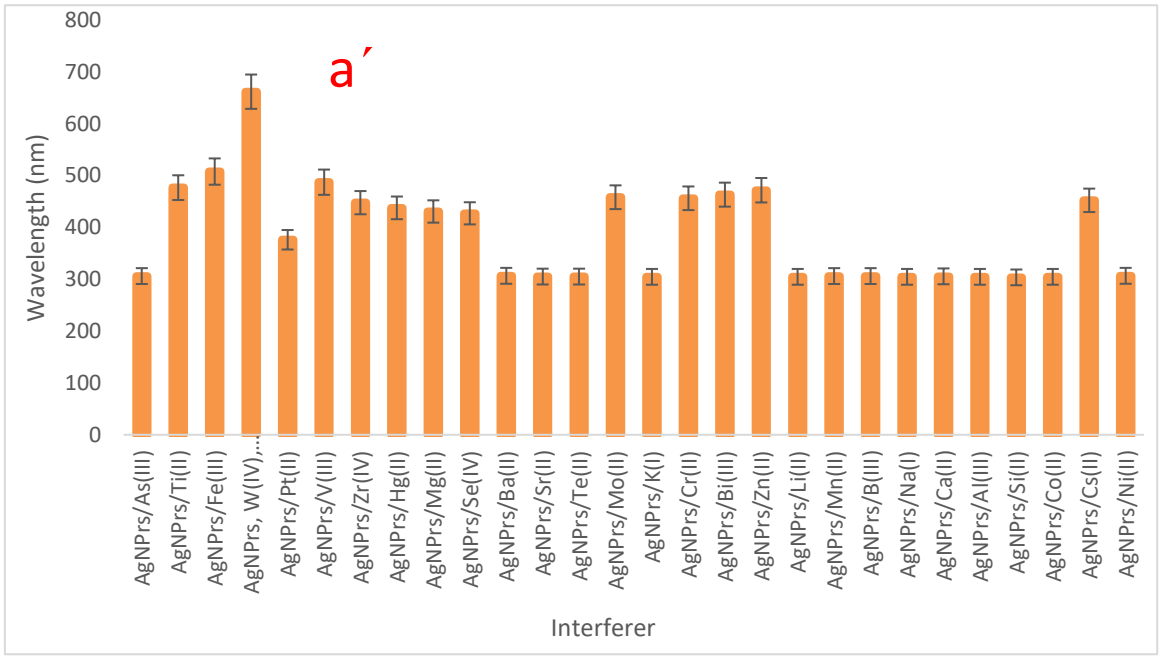
22
23
24
25
26
27
28
A
Absorbance (a.u.)
Wavelength (nm)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
250
350
450
550
650
750
1. AgNPrs/As(III)
2. AgNPrs/Ti(II)
3. AgNPrs/Fe(III)
4. AgNPrs/W(IV)
5. AgNPrs/Pt(II)
6. AgNPrs/V(III)
7. AgNPrs/Zr(IV)
8. AgNPrs/Hg(II)
9. AgNPrs/Mg(II)
10. AgNPrs/Se(IV)
11. AgNPrs/Ba(II)
12. AgNPrs/Sr(II)
13. AgNPrs/Te(II)
14. AgNPrs/Mo(II)
15. AgNPrs/K(I)
16. AgNPrs/Cr(II)
17. AgNPrs/Bi(III)
18. AgNPrs/Zn(II)
19. AgNPrs/Li(II)
20. AgNPrs/Mn(II)
21. AgNPrs/B(III)
22. AgNPrs/Na(I)
23. AgNPrs/Ca(II)
24. AgNPrs/Al(III)
25. AgNPrs/Si(II)
26. AgNPrs/Co(II)
27. AgNPrs/Cs(II)
28. AgNPrs/Ni(II)


a
Absorbance (a.u.)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
AgNPrs/As(III)
AgNPrs/Ti(II)
AgNPrs/Fe(III)
AgNPrs, W(IV), W(IV)
AgNPrs/Pt(II)
AgNPrs/V(III)
AgNPrs/Zr(IV)
AgNPrs/Hg(II)
AgNPrs/Mg(II)
AgNPrs/Se(IV)
AgNPrs/Ba(II)
AgNPrs/Sr(II)
AgNPrs/Te(II)
AgNPrs/Mo(II)
AgNPrs/K(I)
AgNPrs/Cr(II)
AgNPrs/Bi(III)
AgNPrs/Zn(II)
AgNPrs/Li(II)
AgNPrs/Mn(II)
AgNPrs/B(III)
AgNPrs/Na(I)
AgNPrs/Ca(II)
AgNPrs/Al(III)
AgNPrs/Si(II)
AgNPrs/Co(II)
AgNPrs/Cs(II)
AgNPrs/Ni(II)
Interferer


a´
Wavelength (nm)
800
700
600
500
400
300
200
100
0
AgNPrs/As(III)
AgNPrs/Ti(II)
AgNPrs/Fe(III)
AgNPrs, W(IV),...
AgNPrs/Pt(II)
AgNPrs/V(III)
AgNPrs/Zr(IV)
AgNPrs/Hg(II)
AgNPrs/Mg(II)
AgNPrs/Se(IV)
AgNPrs/Ba(II)
AgNPrs/Sr(II)
AgNPrs/Te(II)
AgNPrs/Mo(II)
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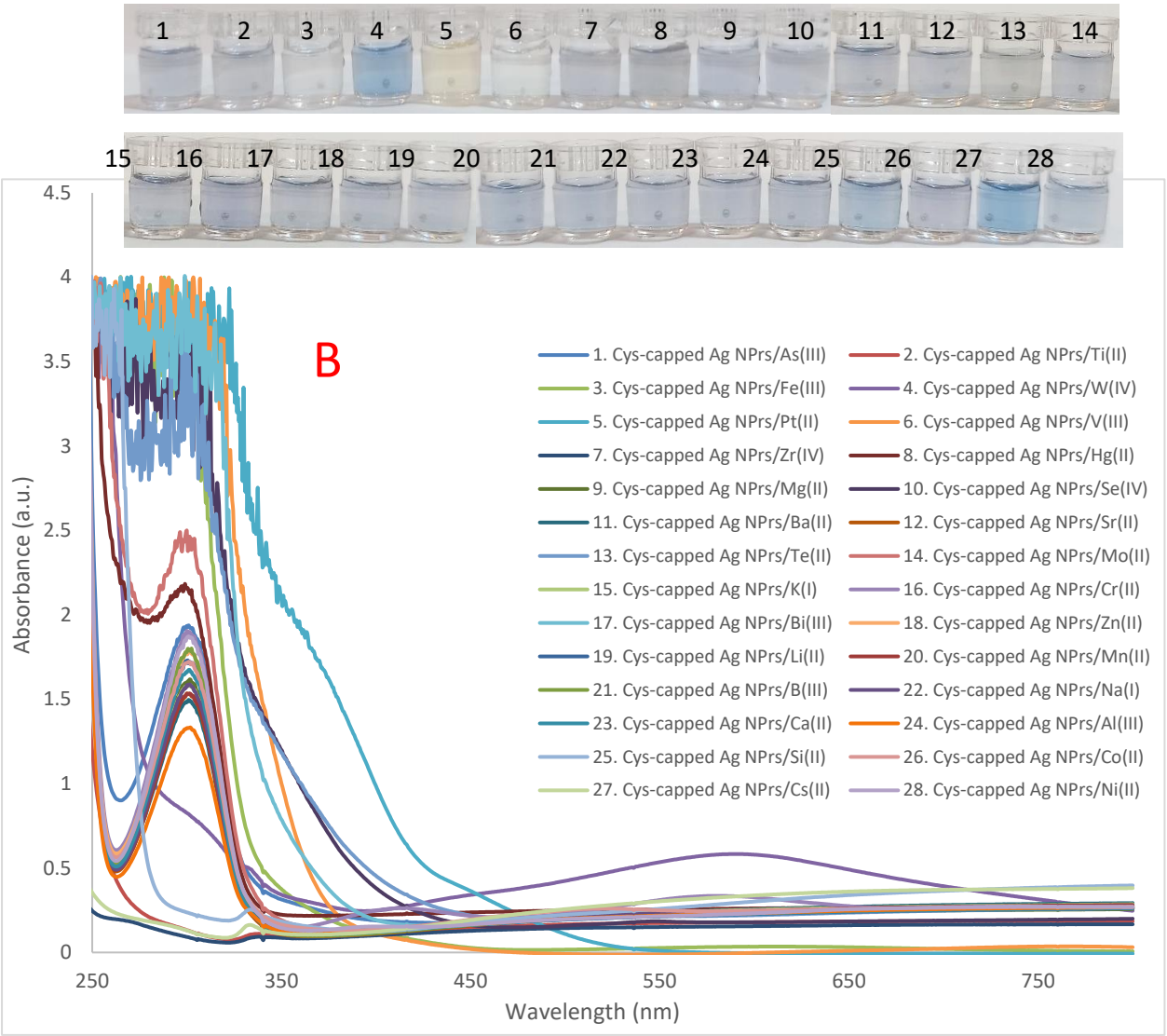
AgNPrs/Ni(II)
Interferer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15 16 17 18 19 20 21 22 23 24 25 26 27 28
B
Absorbance (a.u.)
Wavelength (nm)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
250
350
450
550
650
750
1. Cys-capped Ag NPrs/As(III)
2. Cys-capped Ag NPrs/Ti(II)
3. Cys-capped Ag NPrs/Fe(III)
4. Cys-capped Ag NPrs/W(IV)
5. Cys-capped Ag NPrs/Pt(II)
6. Cys-capped Ag NPrs/V(III)
7. Cys-capped Ag NPrs/Zr(IV)
8. Cys-capped Ag NPrs/Hg(II)
9. Cys-capped Ag NPrs/Mg(II)
10. Cys-capped Ag NPrs/Se(IV)
11. Cys-capped Ag NPrs/Ba(II)
12. Cys-capped Ag NPrs/Sr(II)
13. Cys-capped Ag NPrs/Te(II)
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16. Cys-capped Ag NPrs/Cr(II)
17. Cys-capped Ag NPrs/Bi(III)
18. Cys-capped Ag NPrs/Zn(II)
19. Cys-capped Ag NPrs/Li(II)
20. Cys-capped Ag NPrs/Mn(II)
21. Cys-capped Ag NPrs/B(III)
22. Cys-capped Ag NPrs/Na(I)
23. Cys-capped Ag NPrs/Ca(II)
24. Cys-capped Ag NPrs/Al(III)
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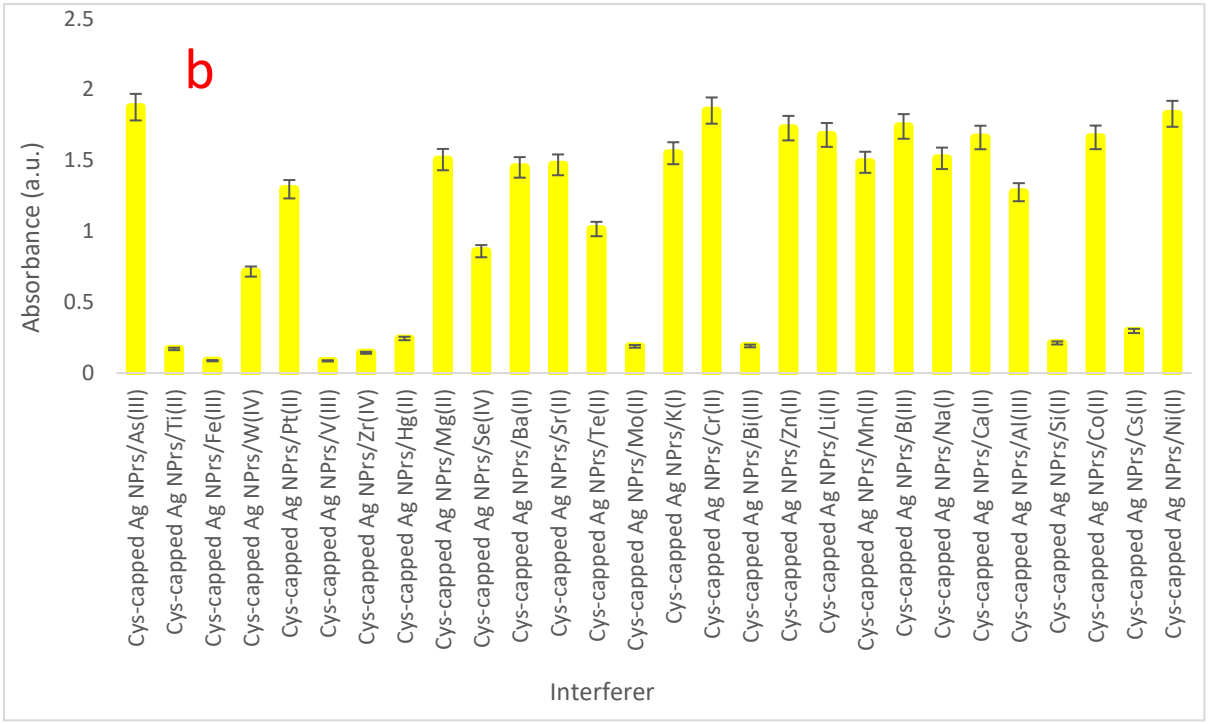
27. Cys-capped Ag NPrs/Cs(II)
28. Cys-capped Ag NPrs/Ni(II)


b
Absorbance (a.u.)
2.5
2
1.5
1
0.5
0
Cys-capped Ag NPrs/As(III)
Cys-capped Ag NPrs/Ti(II)
Cys-capped Ag NPrs/Fe(III)
Cys-capped Ag NPrs/W(IV)
Cys-capped Ag NPrs/Pt(II)
Cys-capped Ag NPrs/V(III)
Cys-capped Ag NPrs/Zr(IV)
Cys-capped Ag NPrs/Hg(II)
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Cys-capped Ag NPrs/Mo(II)
Cys-capped Ag NPrs/K(I)
Cys-capped Ag NPrs/Cr(II)
Cys-capped Ag NPrs/Bi(III)
Cys-capped Ag NPrs/Zn(II)
Cys-capped Ag NPrs/Li(II)
Cys-capped Ag NPrs/Mn(II)
Cys-capped Ag NPrs/B(III)
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Cys-capped Ag NPrs/Si(II)
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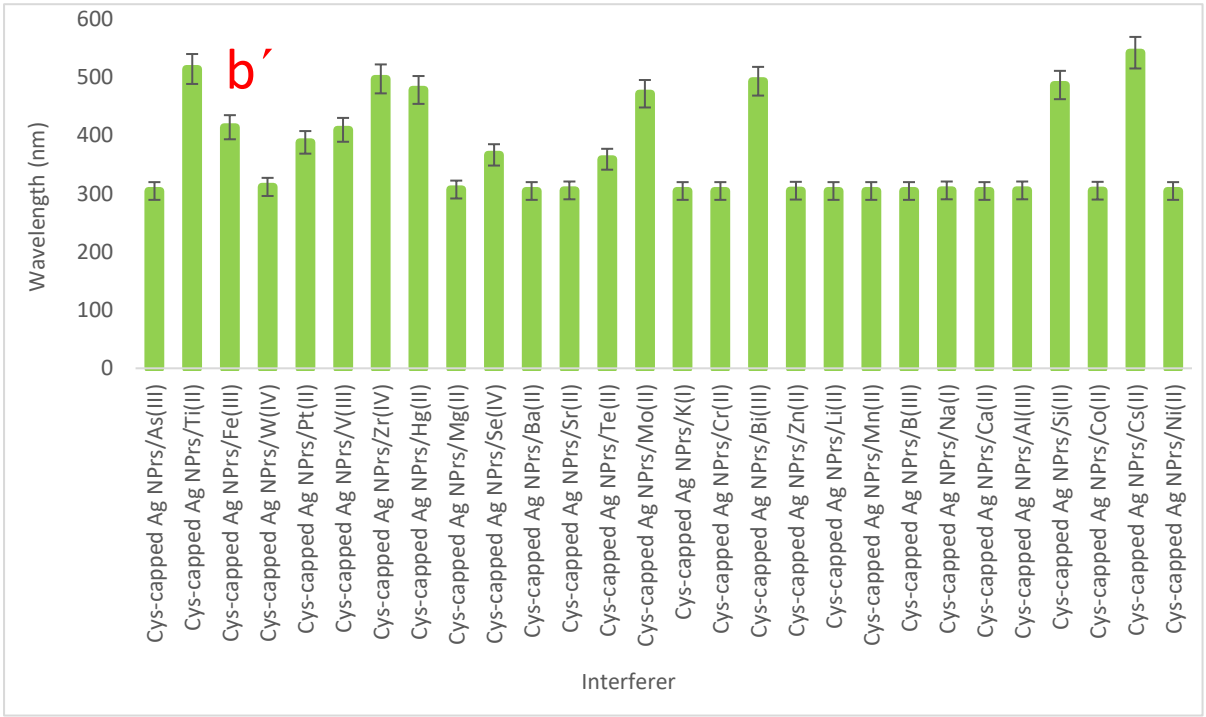
Cys-capped Ag NPrs/Ni(II)
Interferer


b´
Wavelength (nm)
600
500
400
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200
100
0
Cys-capped Ag NPrs/As(III)
Cys-capped Ag NPrs/Ti(II)
Cys-capped Ag NPrs/Fe(III)
Cys-capped Ag NPrs/W(IV)
Cys-capped Ag NPrs/Pt(II)
Cys-capped Ag NPrs/V(III)
Cys-capped Ag NPrs/Zr(IV)
Cys-capped Ag NPrs/Hg(II)
Cys-capped Ag NPrs/Mg(II)
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Cys-capped Ag NPrs/Cr(II)
Cys-capped Ag NPrs/Bi(III)
Cys-capped Ag NPrs/Zn(II)
Cys-capped Ag NPrs/Li(II)
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Cys-capped Ag NPrs/Na(I)
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Cys-capped Ag NPrs/Al(III)
Cys-capped Ag NPrs/Si(II)
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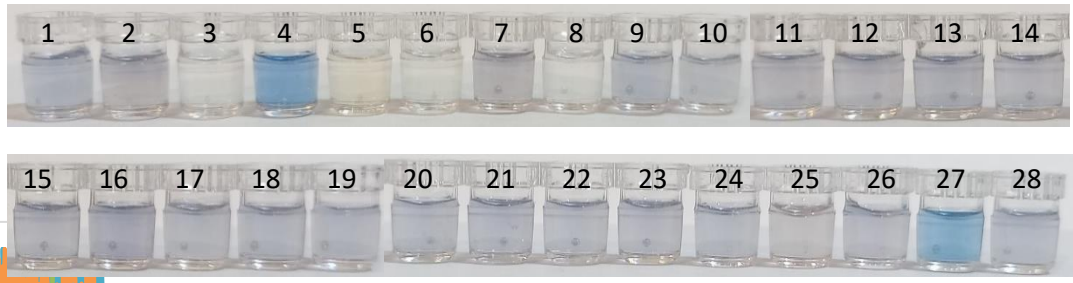
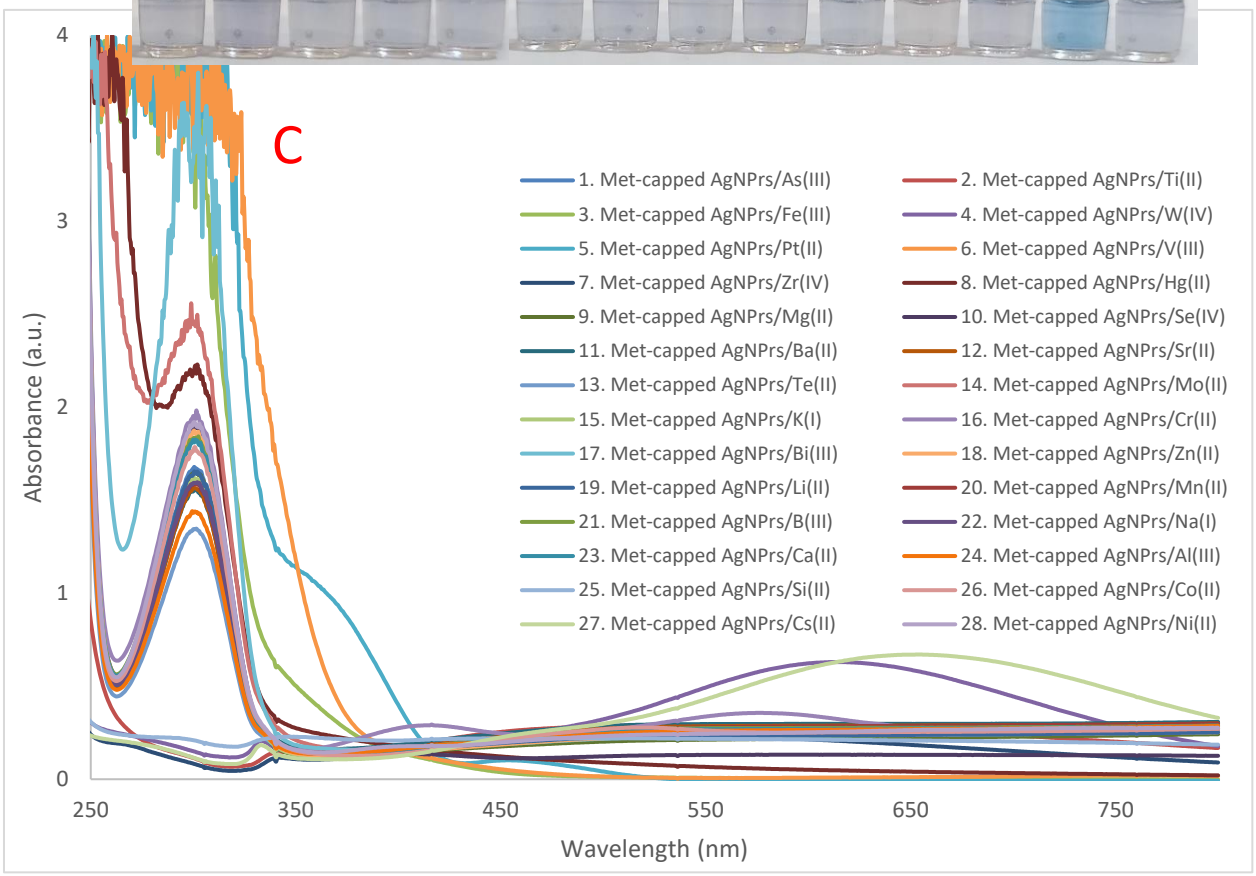
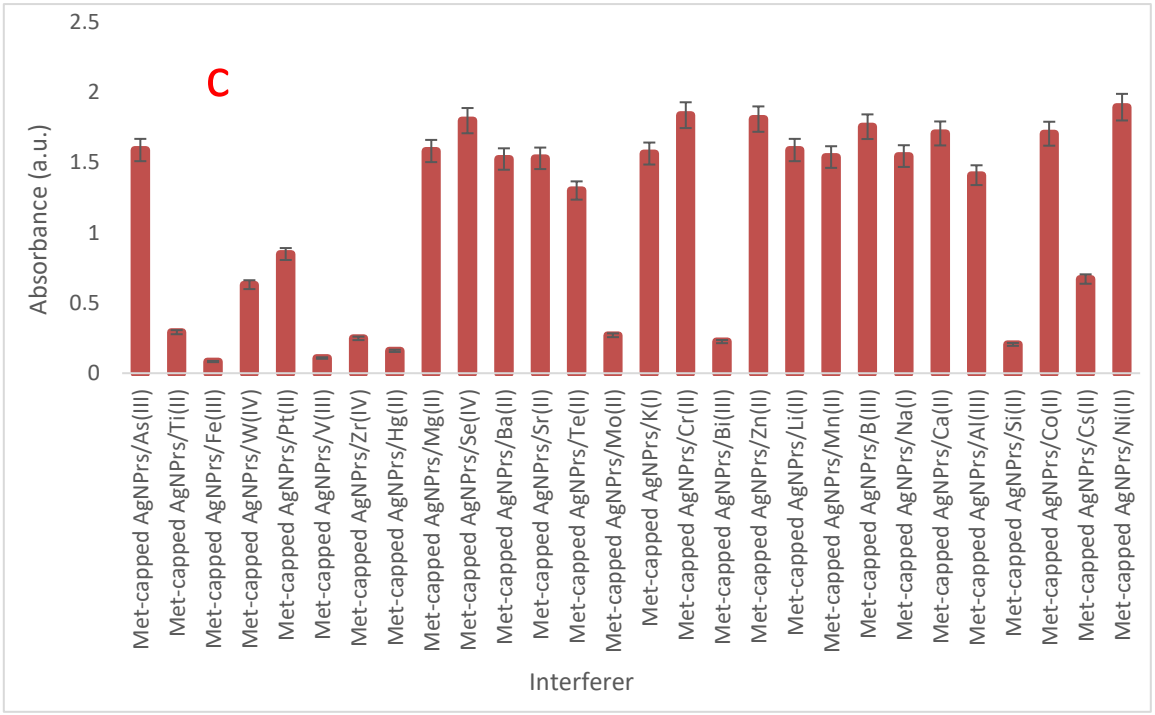
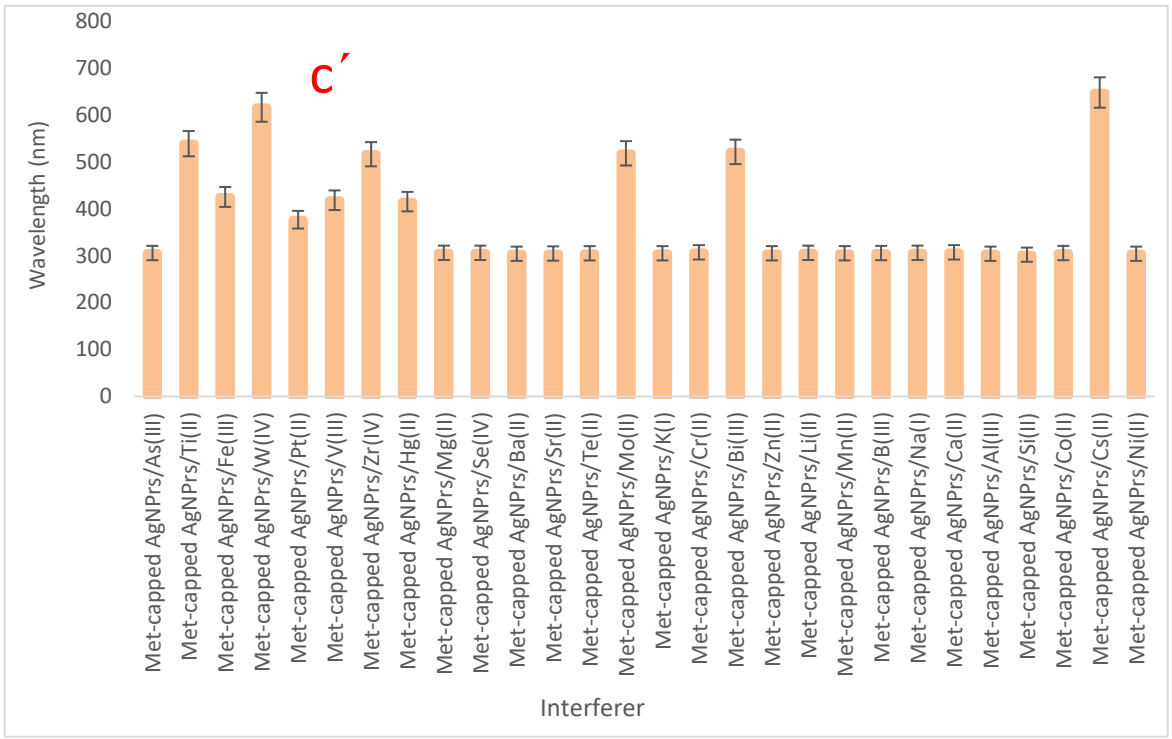
Cys-capped Ag NPrs/Cs(II)
Cys-capped Ag NPrs/Ni(II)
Interferer

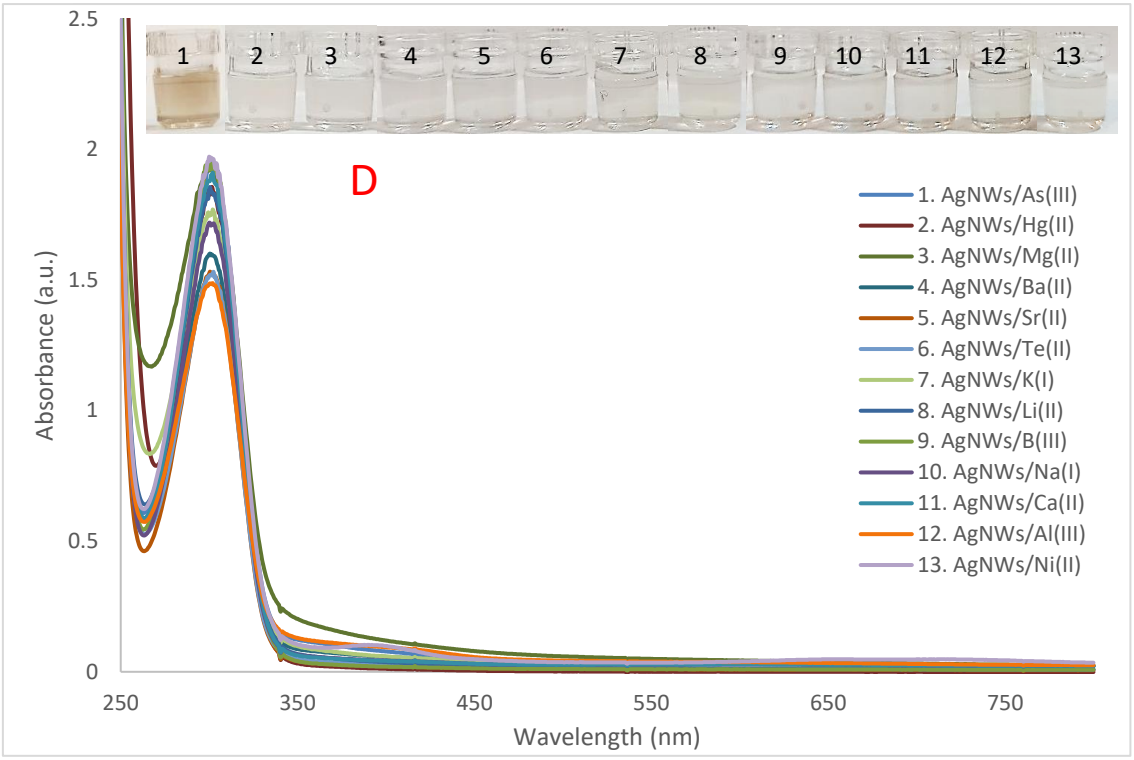

1 2 3 4 5 6 7 8 9 10 11 12 13 14

15 16 17 18 19 20 21 22 23 24 25 26 27 28


C
Absorbance (a.u.)
Wavelength (nm)
0
1
2
3
4
250
350
450
550
650
750
1. Met-capped AgNPrs/As(III)
2. Met-capped AgNPrs/Ti(II)
3. Met-capped AgNPrs/Fe(III)
4. Met-capped AgNPrs/W(IV)
5. Met-capped AgNPrs/Pt(II)
6. Met-capped AgNPrs/V(III)
7. Met-capped AgNPrs/Zr(IV)
8. Met-capped AgNPrs/Hg(II)
9. Met-capped AgNPrs/Mg(II)
10. Met-capped AgNPrs/Se(IV)
11. Met-capped AgNPrs/Ba(II)
12. Met-capped AgNPrs/Sr(II)
13. Met-capped AgNPrs/Te(II)
14. Met-capped AgNPrs/Mo(II)
15. Met-capped AgNPrs/K(I)
16. Met-capped AgNPrs/Cr(II)
17. Met-capped AgNPrs/Bi(III)
18. Met-capped AgNPrs/Zn(II)
19. Met-capped AgNPrs/Li(II)
20. Met-capped AgNPrs/Mn(II)
21. Met-capped AgNPrs/B(III)
22. Met-capped AgNPrs/Na(I)
23. Met-capped AgNPrs/Ca(II)
24. Met-capped AgNPrs/Al(III)
25. Met-capped AgNPrs/Si(II)
26. Met-capped AgNPrs/Co(II)
27. Met-capped AgNPrs/Cs(II)
28. Met-capped AgNPrs/Ni(II)


C
Absorbance (a.u.)
2.5
2
1.5
1
0.5
0
Met-capped AgNPrs/As(III)
Met-capped AgNPrs/Ti(II)
Met-capped AgNPrs/Fe(III)
Met-capped AgNPrs/W(IV)
Met-capped AgNPrs/Pt(II)
Met-capped AgNPrs/V(III)
Met-capped AgNPrs/Zr(IV)
Met-capped AgNPrs/Hg(II)
Met-capped AgNPrs/Mg(II)
Met-capped AgNPrs/Se(IV)
Met-capped AgNPrs/Ba(II)
Met-capped AgNPrs/Sr(II)
Met-capped AgNPrs/Te(II)
Met-capped AgNPrs/Mo(II)
Met-capped AgNPrs/K(I)
Met-capped AgNPrs/Cr(II)
Met-capped AgNPrs/Bi(III)
Met-capped AgNPrs/Zn(II)
Met-capped AgNPrs/Li(II)
Met-capped AgNPrs/Mn(II)
Met-capped AgNPrs/B(III)
Met-capped AgNPrs/Na(I)
Met-capped AgNPrs/Ca(II)
Met-capped AgNPrs/Al(III)
Met-capped AgNPrs/Si(II)
Met-capped AgNPrs/Co(II)
Met-capped AgNPrs/Cs(II)
Met-capped AgNPrs/Ni(II)
Interferer


C´
Wavelength (nm)
800
700
600
500
400
300
200
100
0
Met-capped AgNPrs/As(III)
Met-capped AgNPrs/Ti(II)
Met-capped AgNPrs/Fe(III)
Met-capped AgNPrs/W(IV)
Met-capped AgNPrs/Pt(II)
Met-capped AgNPrs/V(III)
Met-capped AgNPrs/Zr(IV)
Met-capped AgNPrs/Hg(II)
Met-capped AgNPrs/Mg(II)
Met-capped AgNPrs/Se(IV)
Met-capped AgNPrs/Ba(II)
Met-capped AgNPrs/Sr(II)
Met-capped AgNPrs/Te(II)
Met-capped AgNPrs/Mo(II)
Met-capped AgNPrs/K(I)
Met-capped AgNPrs/Cr(II)
Met-capped AgNPrs/Bi(III)
Met-capped AgNPrs/Zn(II)
Met-capped AgNPrs/Li(II)
Met-capped AgNPrs/Mn(II)
Met-capped AgNPrs/B(III)
Met-capped AgNPrs/Na(I)
Met-capped AgNPrs/Ca(II)
Met-capped AgNPrs/Al(III)
Met-capped AgNPrs/Si(II)
Met-capped AgNPrs/Co(II)
Met-capped AgNPrs/Cs(II)
Met-capped AgNPrs/Ni(II)
Interferer



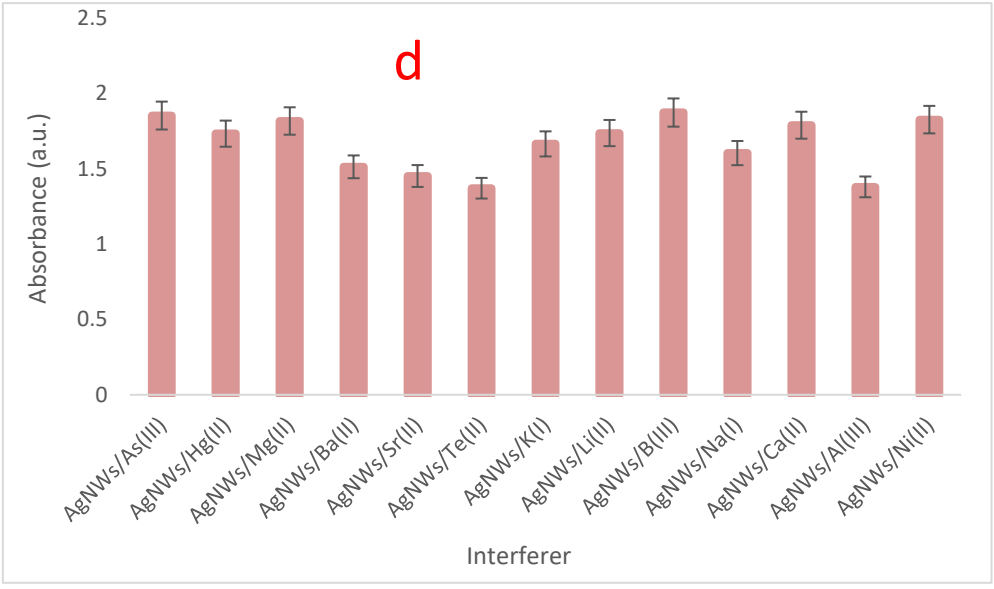
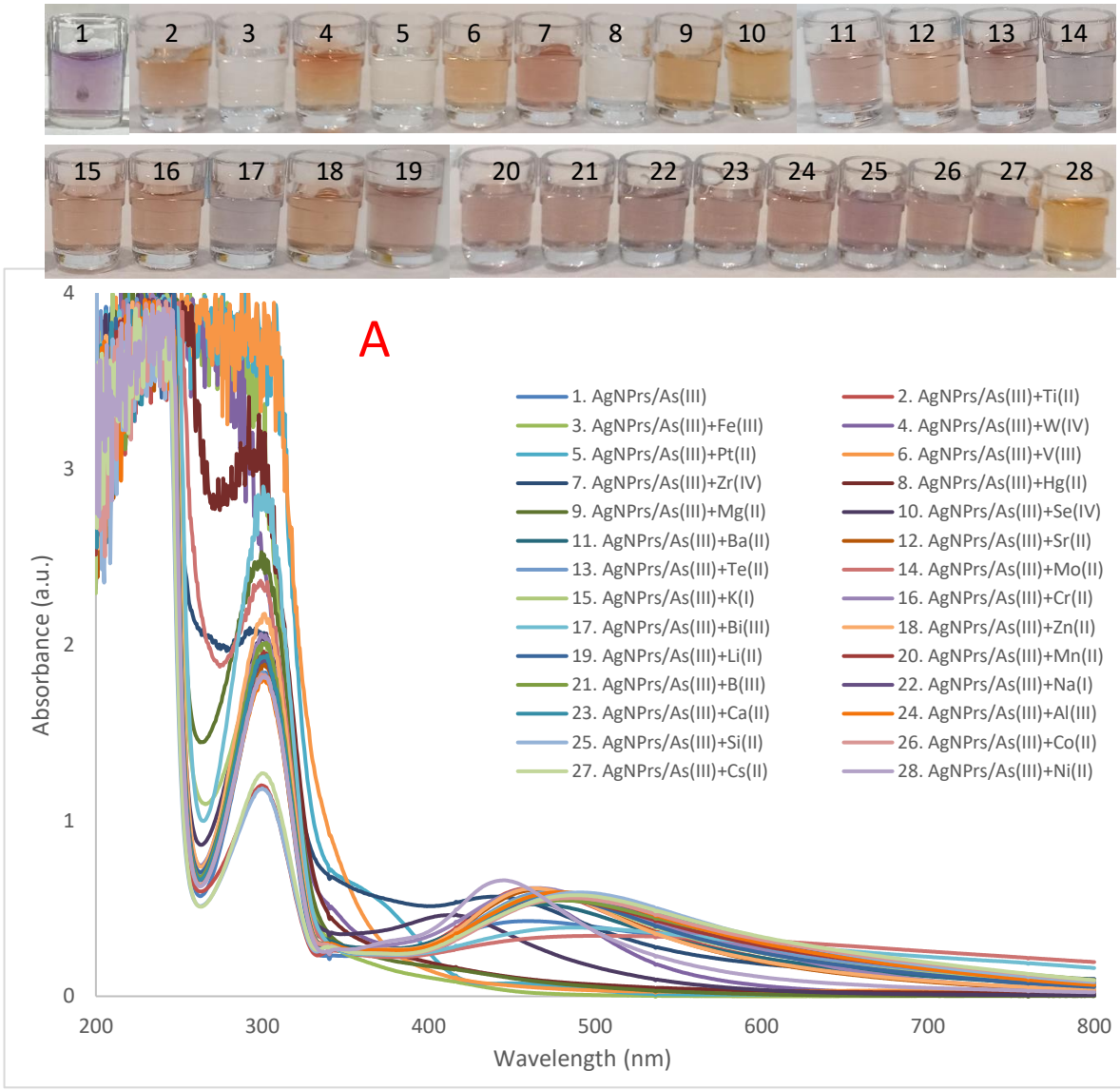


Figure S22. *Selective detection of As (III) among other metal ions using AgNPrs* ***(A)****, Cys-capped AgNPrs* ***(B)****, Met-capped AgNPrs* ***(C)*** *and AgNWs* ***(D)*** *sensing probes and histogram of absorbance and wavelength versus type of interfers species.*


1
2
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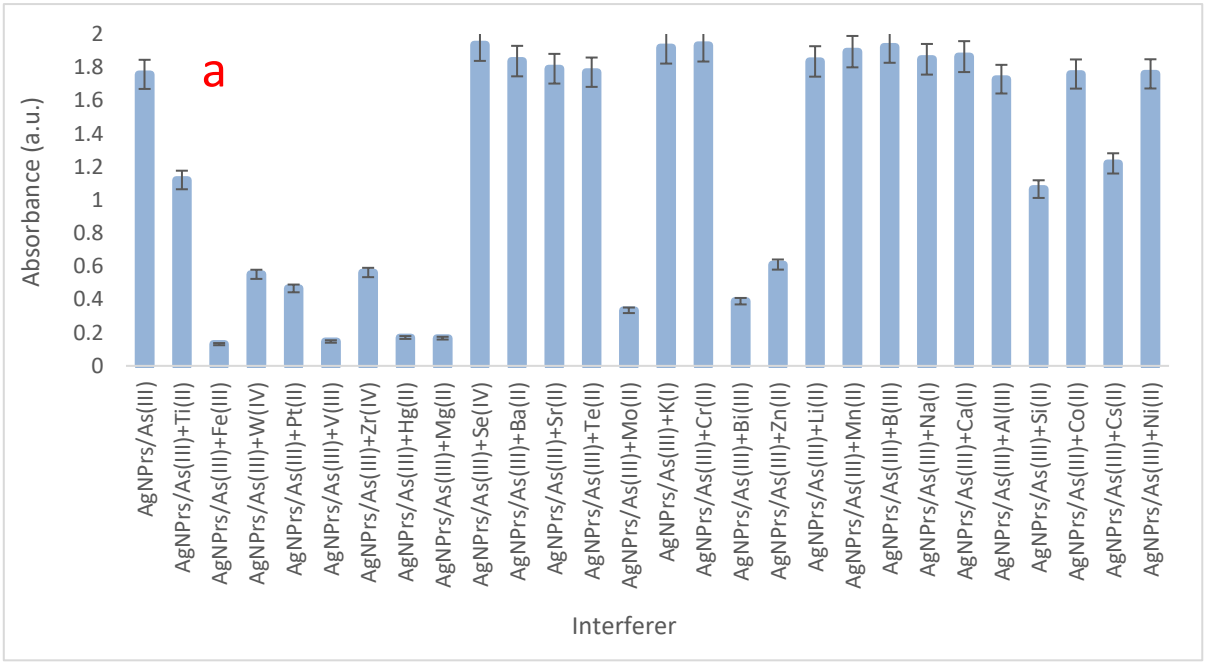
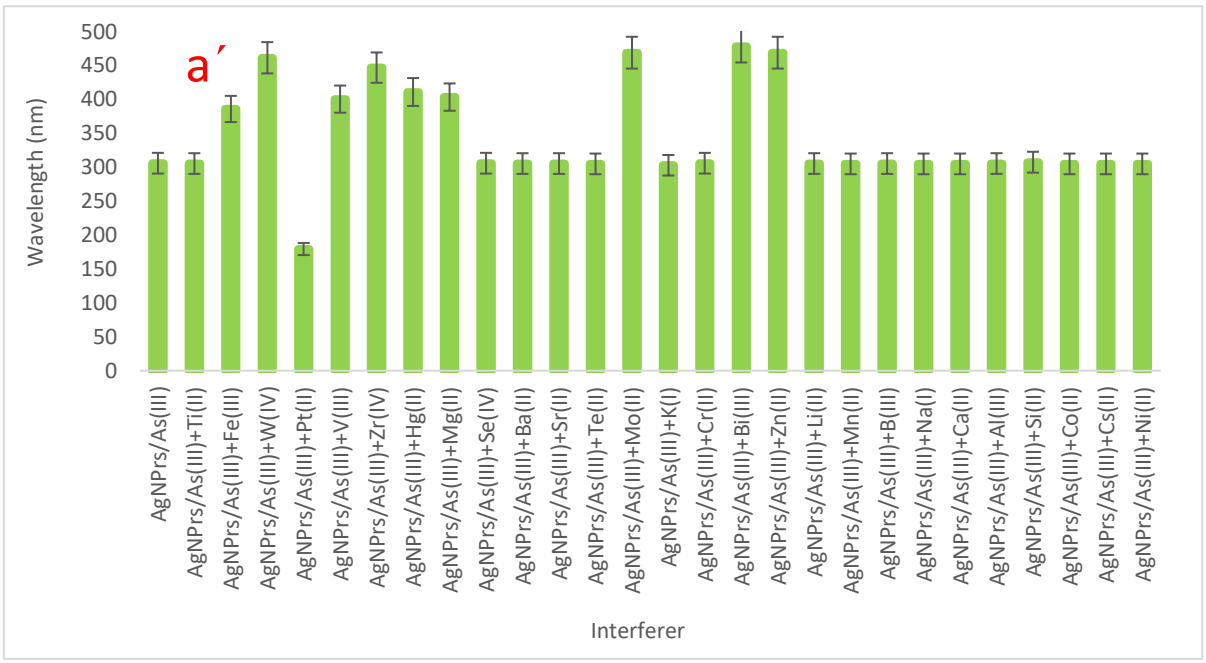
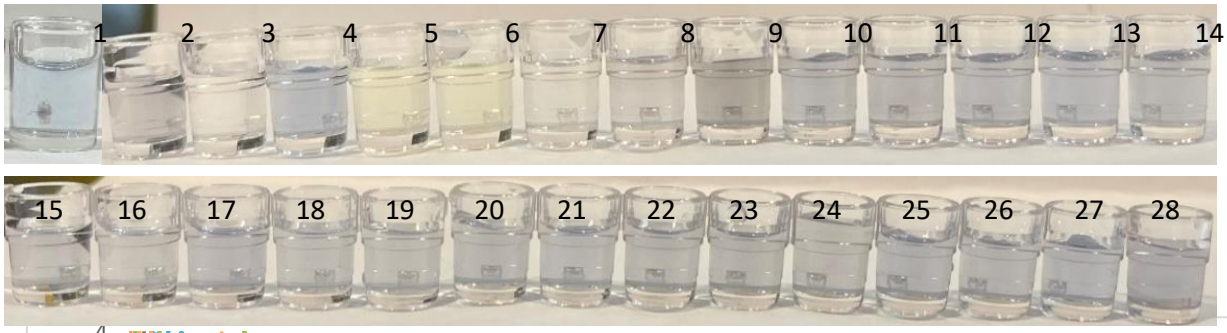
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
A
Absorbance (a.u.)
Wavelength (nm)
0
1
2
3
4
200
300
400
500
600
700
800
1. AgNPrs/As(III)
2. AgNPrs/As(III)+Ti(II)
3. AgNPrs/As(III)+Fe(III)
4. AgNPrs/As(III)+W(IV)
5. AgNPrs/As(III)+Pt(II)
6. AgNPrs/As(III)+V(III)
7. AgNPrs/As(III)+Zr(IV)
8. AgNPrs/As(III)+Hg(II)
9. AgNPrs/As(III)+Mg(II)
10. AgNPrs/As(III)+Se(IV)
11. AgNPrs/As(III)+Ba(II)
12. AgNPrs/As(III)+Sr(II)
13. AgNPrs/As(III)+Te(II)
14. AgNPrs/As(III)+Mo(II)
15. AgNPrs/As(III)+K(I)
16. AgNPrs/As(III)+Cr(II)
17. AgNPrs/As(III)+Bi(III)
18. AgNPrs/As(III)+Zn(II)
19. AgNPrs/As(III)+Li(II)
20. AgNPrs/As(III)+Mn(II)
21. AgNPrs/As(III)+B(III)
22. AgNPrs/As(III)+Na(I)
23. AgNPrs/As(III)+Ca(II)
24. AgNPrs/As(III)+Al(III)
25. AgNPrs/As(III)+Si(II)
26. AgNPrs/As(III)+Co(II)
27. AgNPrs/As(III)+Cs(II)
28. AgNPrs/As(III)+Ni(II)


a
Absorbance (a.u.)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
AgNPrs/As(III)
AgNPrs/As(III)+Ti(II)
AgNPrs/As(III)+Fe(III)
AgNPrs/As(III)+W(IV)
AgNPrs/As(III)+Pt(II)
AgNPrs/As(III)+V(III)
AgNPrs/As(III)+Zr(IV)
AgNPrs/As(III)+Hg(II)
AgNPrs/As(III)+Mg(II)
AgNPrs/As(III)+Se(IV)
AgNPrs/As(III)+Ba(II)
AgNPrs/As(III)+Sr(II)
AgNPrs/As(III)+Te(II)
AgNPrs/As(III)+Mo(II)
AgNPrs/As(III)+K(I)
AgNPrs/As(III)+Cr(II)
AgNPrs/As(III)+Bi(III)
AgNPrs/As(III)+Zn(II)
AgNPrs/As(III)+Li(II)
AgNPrs/As(III)+Mn(II)
AgNPrs/As(III)+B(III)
AgNPrs/As(III)+Na(I)
AgNPrs/As(III)+Ca(II)
AgNPrs/As(III)+Al(III)
AgNPrs/As(III)+Si(II)
AgNPrs/As(III)+Co(II)
AgNPrs/As(III)+Cs(II)
AgNPrs/As(III)+Ni(II)
Interferer


a´
Wavelength (nm)
500
450
400
350
300
250
200
150
100
50
0
AgNPrs/As(III)
AgNPrs/As(III)+Ti(II)
AgNPrs/As(III)+Fe(III)
AgNPrs/As(III)+W(IV)
AgNPrs/As(III)+Pt(II)
AgNPrs/As(III)+V(III)
AgNPrs/As(III)+Zr(IV)
AgNPrs/As(III)+Hg(II)
AgNPrs/As(III)+Mg(II)
AgNPrs/As(III)+Se(IV)
AgNPrs/As(III)+Ba(II)
AgNPrs/As(III)+Sr(II)
AgNPrs/As(III)+Te(II)
AgNPrs/As(III)+Mo(II)
AgNPrs/As(III)+K(I)
AgNPrs/As(III)+Cr(II)
AgNPrs/As(III)+Bi(III)
AgNPrs/As(III)+Zn(II)
AgNPrs/As(III)+Li(II)
AgNPrs/As(III)+Mn(II)
AgNPrs/As(III)+B(III)
AgNPrs/As(III)+Na(I)
AgNPrs/As(III)+Ca(II)
AgNPrs/As(III)+Al(III)
AgNPrs/As(III)+Si(II)
AgNPrs/As(III)+Co(II)
AgNPrs/As(III)+Cs(II)
AgNPrs/As(III)+Ni(II)
Interferer


1
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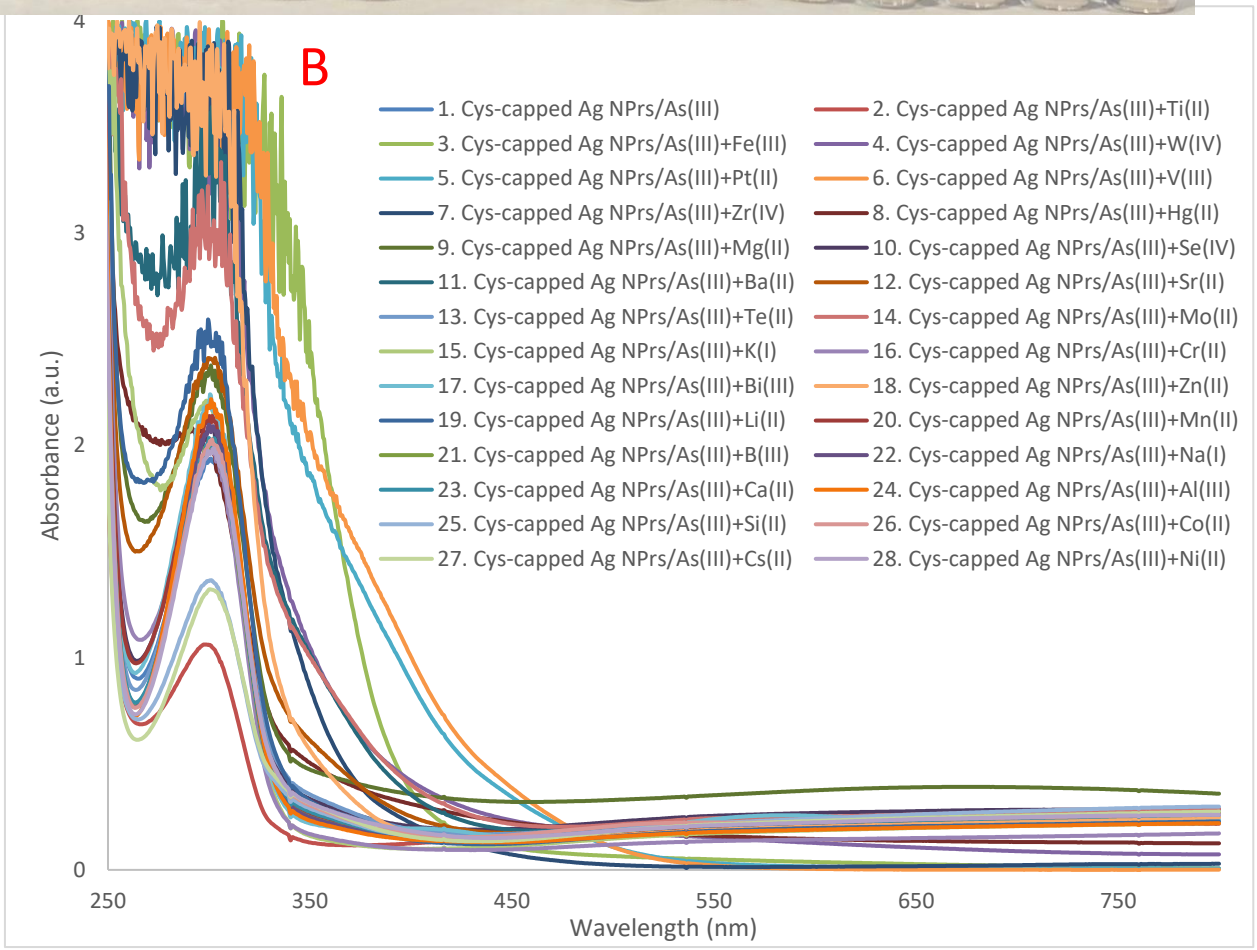
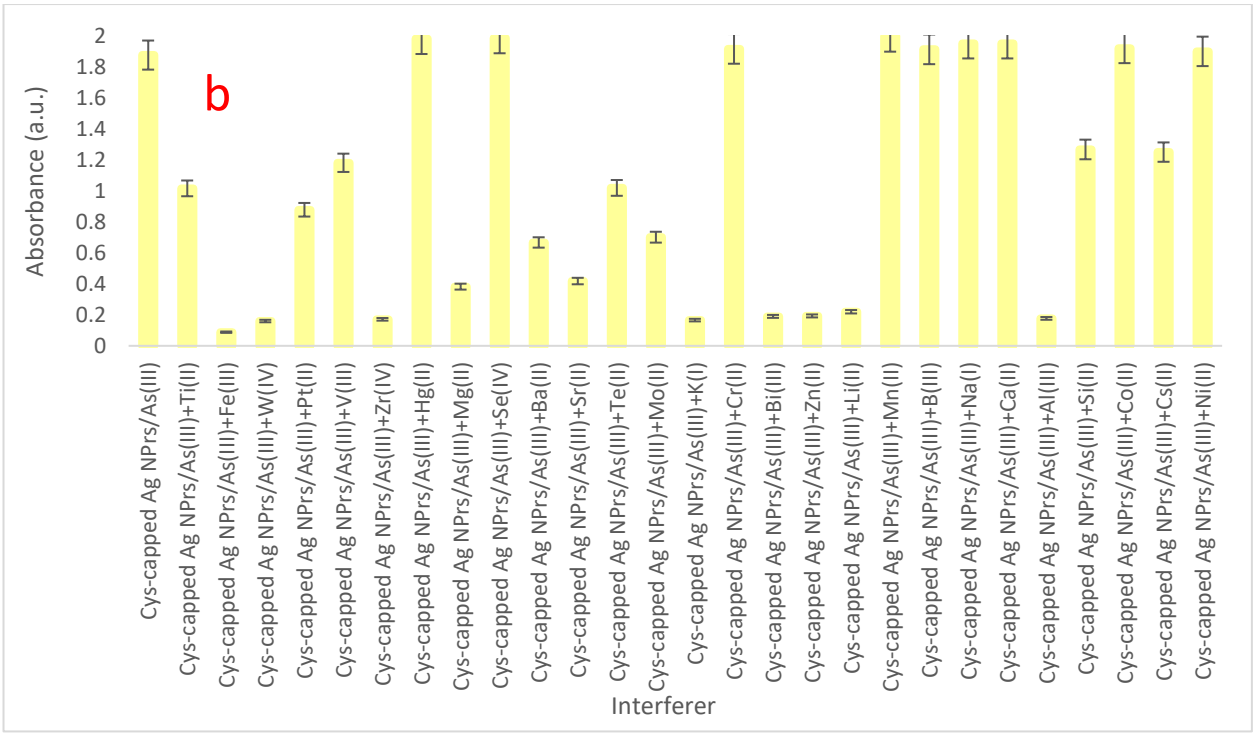
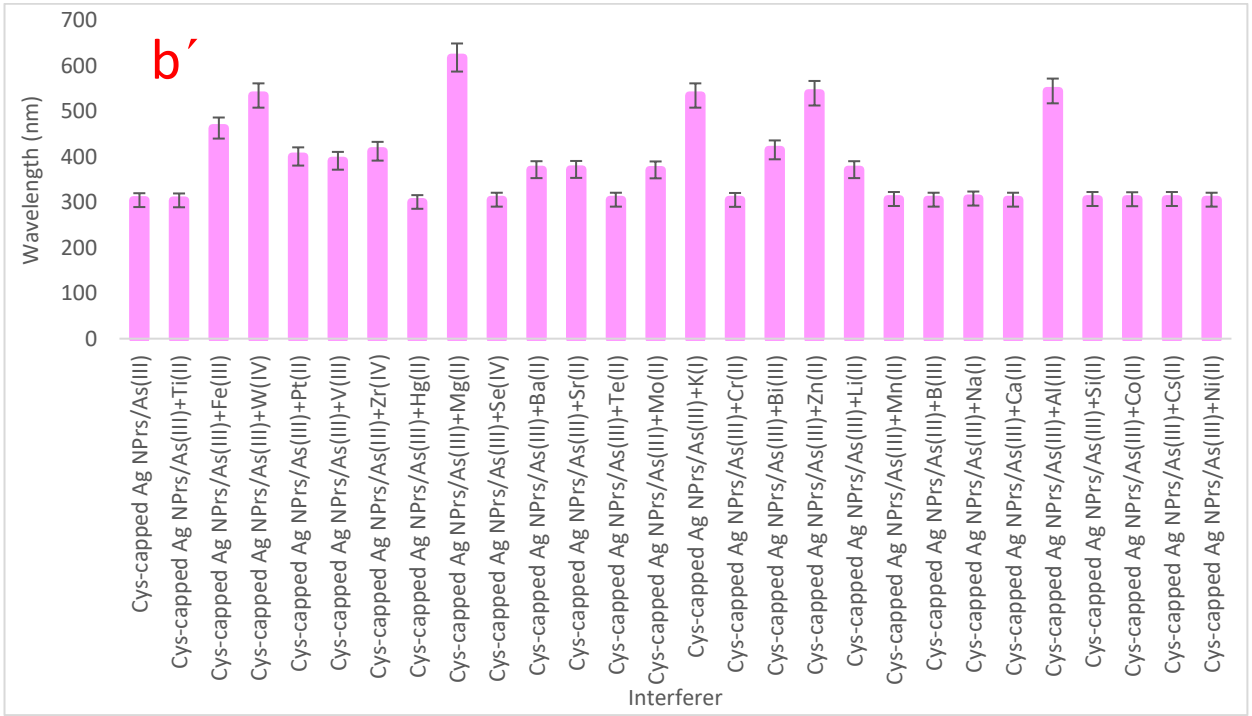
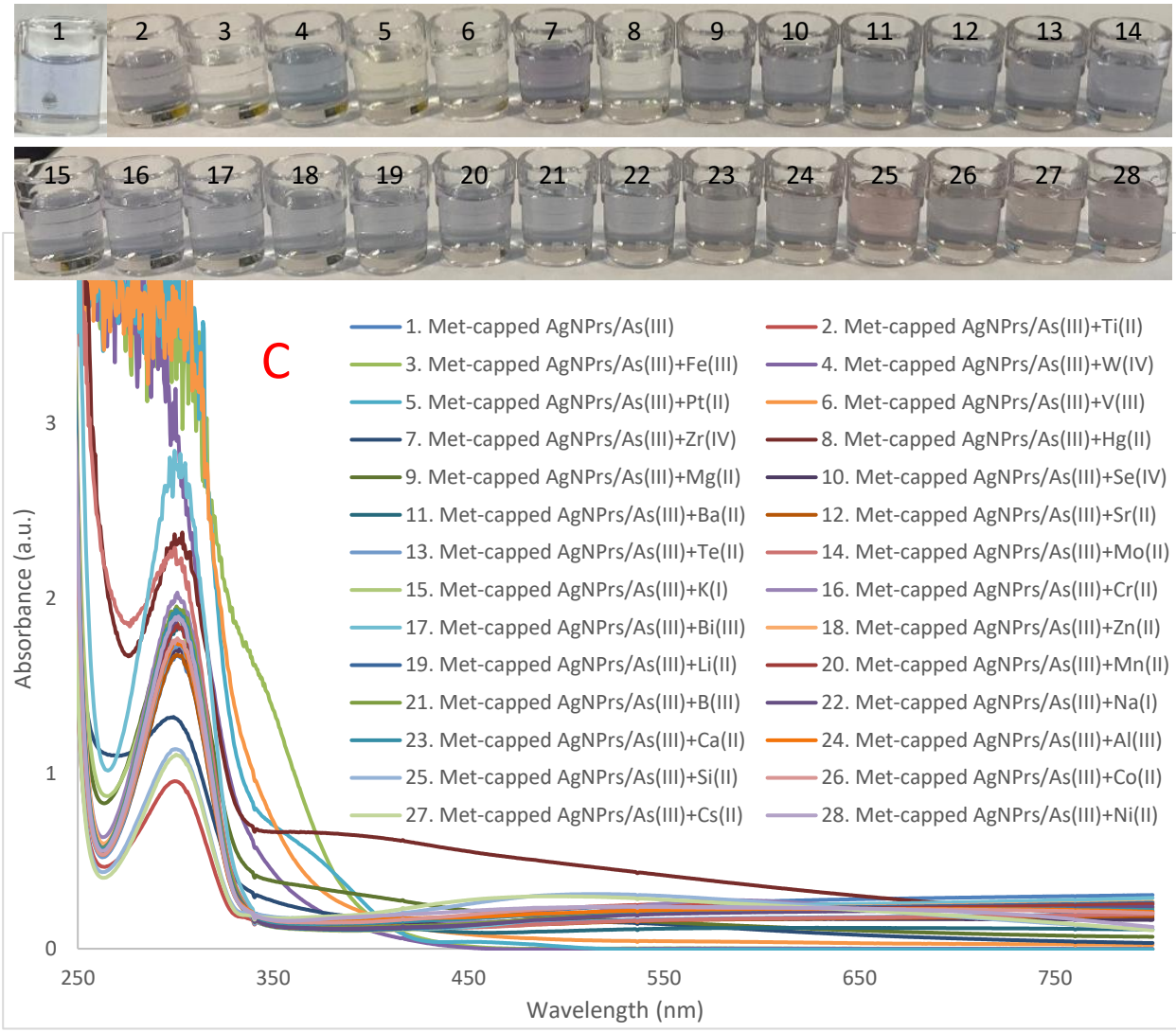
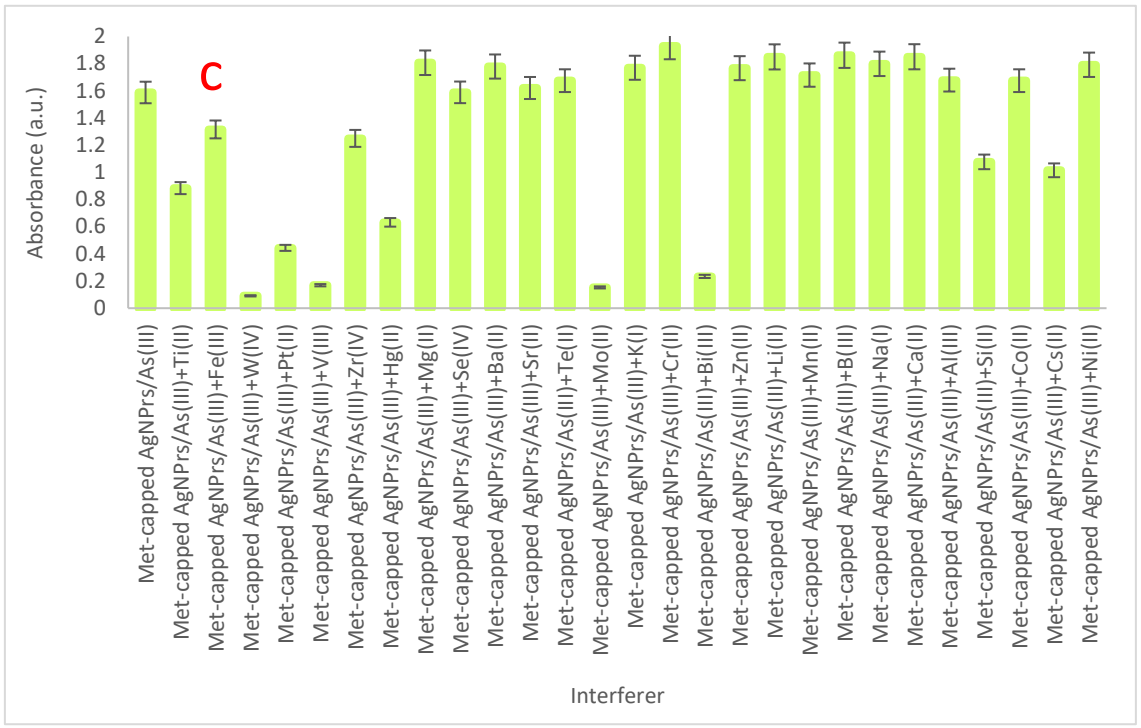
28

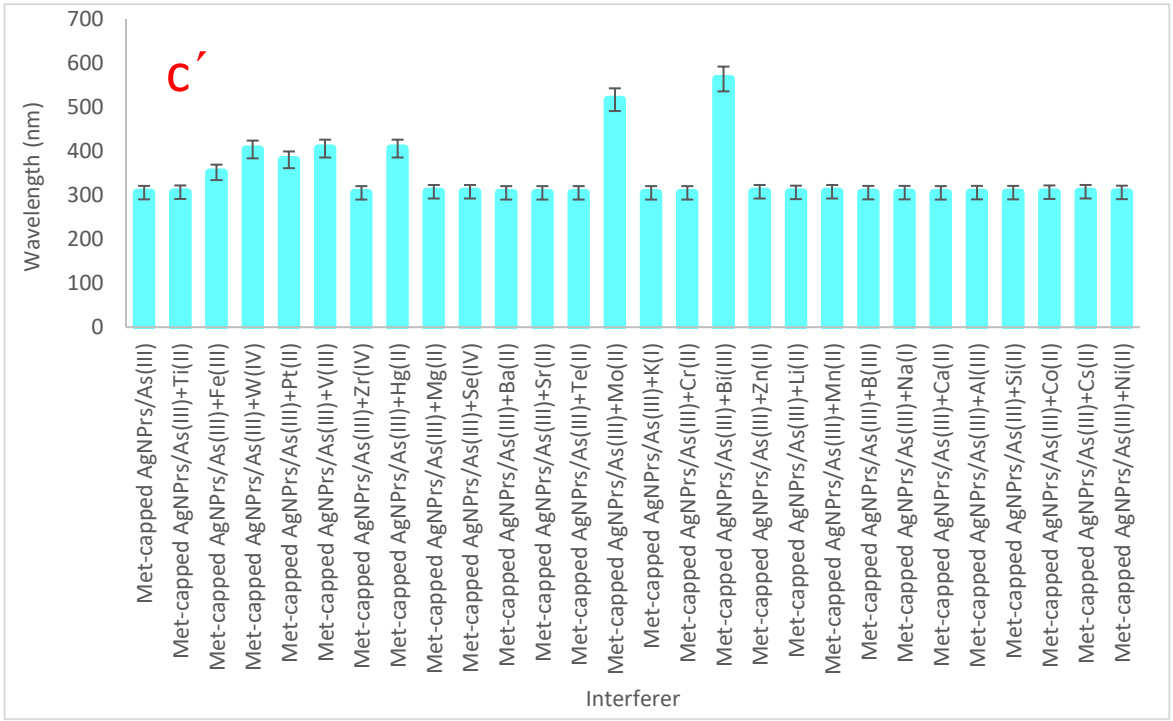

B
Absorbance (a.u.)
Wavelength (nm)
0
1
2
3
4
250
350
450
550
650
750
1. Cys-capped Ag NPrs/As(III)
2. Cys-capped Ag NPrs/As(III)+Ti(II)
3. Cys-capped Ag NPrs/As(III)+Fe(III)
4. Cys-capped Ag NPrs/As(III)+W(IV)
5. Cys-capped Ag NPrs/As(III)+Pt(II)
6. Cys-capped Ag NPrs/As(III)+V(III)
7. Cys-capped Ag NPrs/As(III)+Zr(IV)
8. Cys-capped Ag NPrs/As(III)+Hg(II)
9. Cys-capped Ag NPrs/As(III)+Mg(II)
10. Cys-capped Ag NPrs/As(III)+Se(IV)
11. Cys-capped Ag NPrs/As(III)+Ba(II)
12. Cys-capped Ag NPrs/As(III)+Sr(II)
13. Cys-capped Ag NPrs/As(III)+Te(II)
14. Cys-capped Ag NPrs/As(III)+Mo(II)
15. Cys-capped Ag NPrs/As(III)+K(I)
16. Cys-capped Ag NPrs/As(III)+Cr(II)
17. Cys-capped Ag NPrs/As(III)+Bi(III)
18. Cys-capped Ag NPrs/As(III)+Zn(II)
19. Cys-capped Ag NPrs/As(III)+Li(II)
20. Cys-capped Ag NPrs/As(III)+Mn(II)
21. Cys-capped Ag NPrs/As(III)+B(III)
22. Cys-capped Ag NPrs/As(III)+Na(I)
23. Cys-capped Ag NPrs/As(III)+Ca(II)
24. Cys-capped Ag NPrs/As(III)+Al(III)
25. Cys-capped Ag NPrs/As(III)+Si(II)
26. Cys-capped Ag NPrs/As(III)+Co(II)
27. Cys-capped Ag NPrs/As(III)+Cs(II)
28. Cys-capped Ag NPrs/As(III)+Ni(II)

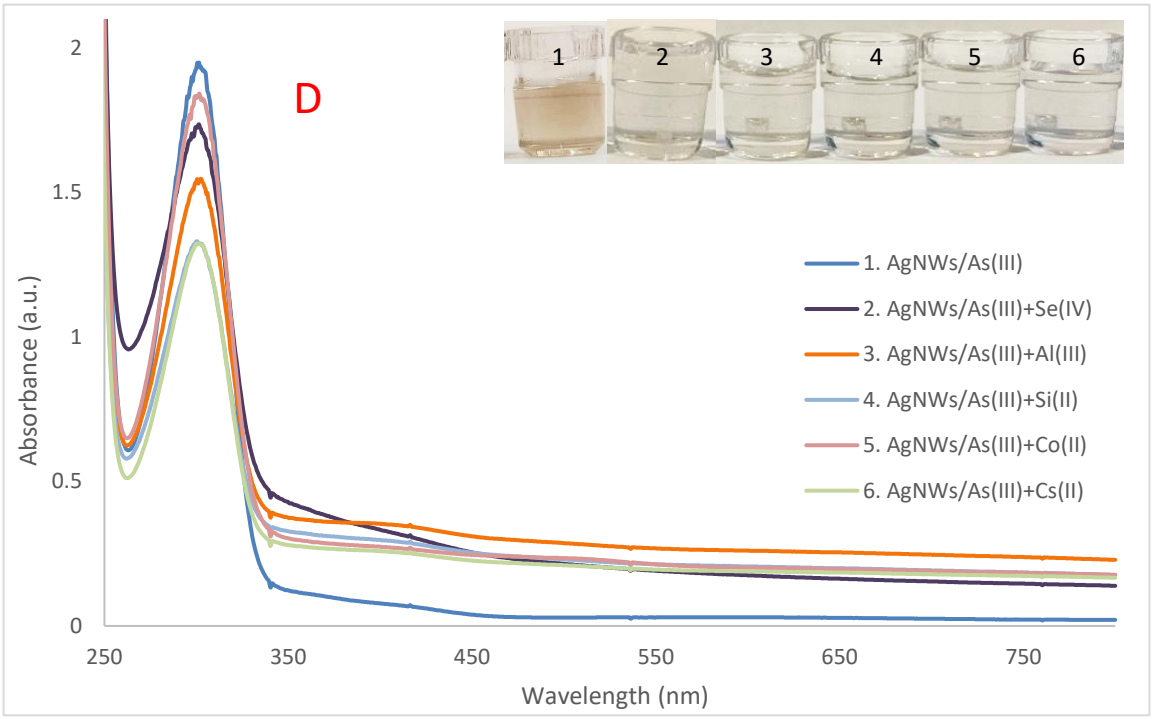

b
Absorbance (a.u.)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Cys-capped Ag NPrs/As(III)
Cys-capped Ag NPrs/As(III)+Ti(II)
Cys-capped Ag NPrs/As(III)+Fe(III)
Cys-capped Ag NPrs/As(III)+W(IV)
Cys-capped Ag NPrs/As(III)+Pt(II)
Cys-capped Ag NPrs/As(III)+V(III)
Cys-capped Ag NPrs/As(III)+Zr(IV)
Cys-capped Ag NPrs/As(III)+Hg(II)
Cys-capped Ag NPrs/As(III)+Mg(II)
Cys-capped Ag NPrs/As(III)+Se(IV)
Cys-capped Ag NPrs/As(III)+Ba(II)
Cys-capped Ag NPrs/As(III)+Sr(II)
Cys-capped Ag NPrs/As(III)+Te(II)
Cys-capped Ag NPrs/As(III)+Mo(II)
Cys-capped Ag NPrs/As(III)+K(I)
Cys-capped Ag NPrs/As(III)+Cr(II)
Cys-capped Ag NPrs/As(III)+Bi(III)
Cys-capped Ag NPrs/As(III)+Zn(II)
Cys-capped Ag NPrs/As(III)+Li(II)
Cys-capped Ag NPrs/As(III)+Mn(II)
Cys-capped Ag NPrs/As(III)+B(III)
Cys-capped Ag NPrs/As(III)+Na(I)
Cys-capped Ag NPrs/As(III)+Ca(II)
Cys-capped Ag NPrs/As(III)+Al(III)
Cys-capped Ag NPrs/As(III)+Si(II)
Cys-capped Ag NPrs/As(III)+Co(II)
Cys-capped Ag NPrs/As(III)+Cs(II)
Cys-capped Ag NPrs/As(III)+Ni(II)
Interferer


b´
Wavelength (nm)
700
600
500
400
300
200
100
0
Cys-capped Ag NPrs/As(III)
Cys-capped Ag NPrs/As(III)+Ti(II)
Cys-capped Ag NPrs/As(III)+Fe(III)
Cys-capped Ag NPrs/As(III)+W(IV)
Cys-capped Ag NPrs/As(III)+Pt(II)
Cys-capped Ag NPrs/As(III)+V(III)
Cys-capped Ag NPrs/As(III)+Zr(IV)
Cys-capped Ag NPrs/As(III)+Hg(II)
Cys-capped Ag NPrs/As(III)+Mg(II)
Cys-capped Ag NPrs/As(III)+Se(IV)
Cys-capped Ag NPrs/As(III)+Ba(II)
Cys-capped Ag NPrs/As(III)+Sr(II)
Cys-capped Ag NPrs/As(III)+Te(II)
Cys-capped Ag NPrs/As(III)+Mo(II)
Cys-capped Ag NPrs/As(III)+K(I)
Cys-capped Ag NPrs/As(III)+Cr(II)
Cys-capped Ag NPrs/As(III)+Bi(III)
Cys-capped Ag NPrs/As(III)+Zn(II)
Cys-capped Ag NPrs/As(III)+Li(II)
Cys-capped Ag NPrs/As(III)+Mn(II)
Cys-capped Ag NPrs/As(III)+B(III)
Cys-capped Ag NPrs/As(III)+Na(I)
Cys-capped Ag NPrs/As(III)+Ca(II)
Cys-capped Ag NPrs/As(III)+Al(III)
Cys-capped Ag NPrs/As(III)+Si(II)
Cys-capped Ag NPrs/As(III)+Co(II)
Cys-capped Ag NPrs/As(III)+Cs(II)
Cys-capped Ag NPrs/As(III)+Ni(II)
Interferer


1 2 3 4 5 6 7 8 9 10 11 12 13 14
15 16 17 18 19 20 21 22 23 24 25 26 27 28
C
Absorbance (a.u.)
0
1
2
3
250
350
450
550
650
750
Wavelength (nm)
1. Met-capped AgNPrs/As(III)
2. Met-capped AgNPrs/As(III)+Ti(II)
3. Met-capped AgNPrs/As(III)+Fe(III)
4. Met-capped AgNPrs/As(III)+W(IV)
5. Met-capped AgNPrs/As(III)+Pt(II)
6. Met-capped AgNPrs/As(III)+V(III)
7. Met-capped AgNPrs/As(III)+Zr(IV)
8. Met-capped AgNPrs/As(III)+Hg(II)
9. Met-capped AgNPrs/As(III)+Mg(II)
10. Met-capped AgNPrs/As(III)+Se(IV)
11. Met-capped AgNPrs/As(III)+Ba(II)
12. Met-capped AgNPrs/As(III)+Sr(II)
13. Met-capped AgNPrs/As(III)+Te(II)
14. Met-capped AgNPrs/As(III)+Mo(II)
15. Met-capped AgNPrs/As(III)+K(I)
16. Met-capped AgNPrs/As(III)+Cr(II)
17. Met-capped AgNPrs/As(III)+Bi(III)
18. Met-capped AgNPrs/As(III)+Zn(II)
19. Met-capped AgNPrs/As(III)+Li(II)
20. Met-capped AgNPrs/As(III)+Mn(II)
21. Met-capped AgNPrs/As(III)+B(III)
22. Met-capped AgNPrs/As(III)+Na(I)
23. Met-capped AgNPrs/As(III)+Ca(II)
24. Met-capped AgNPrs/As(III)+Al(III)
25. Met-capped AgNPrs/As(III)+Si(II)
26. Met-capped AgNPrs/As(III)+Co(II)
27. Met-capped AgNPrs/As(III)+Cs(II)
28. Met-capped AgNPrs/As(III)+Ni(II)


C
Absorbance (a.u.)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Met-capped AgNPrs/As(III)
Met-capped AgNPrs/As(III)+Ti(II)
Met-capped AgNPrs/As(III)+Fe(III)
Met-capped AgNPrs/As(III)+W(IV)
Met-capped AgNPrs/As(III)+Pt(II)
Met-capped AgNPrs/As(III)+V(III)
Met-capped AgNPrs/As(III)+Zr(IV)
Met-capped AgNPrs/As(III)+Hg(II)
Met-capped AgNPrs/As(III)+Mg(II)
Met-capped AgNPrs/As(III)+Se(IV)
Met-capped AgNPrs/As(III)+Ba(II)
Met-capped AgNPrs/As(III)+Sr(II)
Met-capped AgNPrs/As(III)+Te(II)
Met-capped AgNPrs/As(III)+Mo(II)
Met-capped AgNPrs/As(III)+K(I)
Met-capped AgNPrs/As(III)+Cr(II)
Met-capped AgNPrs/As(III)+Bi(III)
Met-capped AgNPrs/As(III)+Zn(II)
Met-capped AgNPrs/As(III)+Li(II)
Met-capped AgNPrs/As(III)+Mn(II)
Met-capped AgNPrs/As(III)+B(III)
Met-capped AgNPrs/As(III)+Na(I)
Met-capped AgNPrs/As(III)+Ca(II)
Met-capped AgNPrs/As(III)+Al(III)
Met-capped AgNPrs/As(III)+Si(II)
Met-capped AgNPrs/As(III)+Co(II)
Met-capped AgNPrs/As(III)+Cs(II)
Met-capped AgNPrs/As(III)+Ni(II)
Interferer


C´
Wavelength (nm)
700
600
500
400
300
200
100
0
Met-capped AgNPrs/As(III)
Met-capped AgNPrs/As(III)+Ti(II)
Met-capped AgNPrs/As(III)+Fe(III)
Met-capped AgNPrs/As(III)+W(IV)
Met-capped AgNPrs/As(III)+Pt(II)
Met-capped AgNPrs/As(III)+V(III)
Met-capped AgNPrs/As(III)+Zr(IV)
Met-capped AgNPrs/As(III)+Hg(II)
Met-capped AgNPrs/As(III)+Mg(II)
Met-capped AgNPrs/As(III)+Se(IV)
Met-capped AgNPrs/As(III)+Ba(II)
Met-capped AgNPrs/As(III)+Sr(II)
Met-capped AgNPrs/As(III)+Te(II)
Met-capped AgNPrs/As(III)+Mo(II)
Met-capped AgNPrs/As(III)+K(I)
Met-capped AgNPrs/As(III)+Cr(II)
Met-capped AgNPrs/As(III)+Bi(III)
Met-capped AgNPrs/As(III)+Zn(II)
Met-capped AgNPrs/As(III)+Li(II)
Met-capped AgNPrs/As(III)+Mn(II)
Met-capped AgNPrs/As(III)+B(III)
Met-capped AgNPrs/As(III)+Na(I)
Met-capped AgNPrs/As(III)+Ca(II)
Met-capped AgNPrs/As(III)+Al(III)
Met-capped AgNPrs/As(III)+Si(II)
Met-capped AgNPrs/As(III)+Co(II)
Met-capped AgNPrs/As(III)+Cs(II)
Met-capped AgNPrs/As(III)+Ni(II)
Interferer



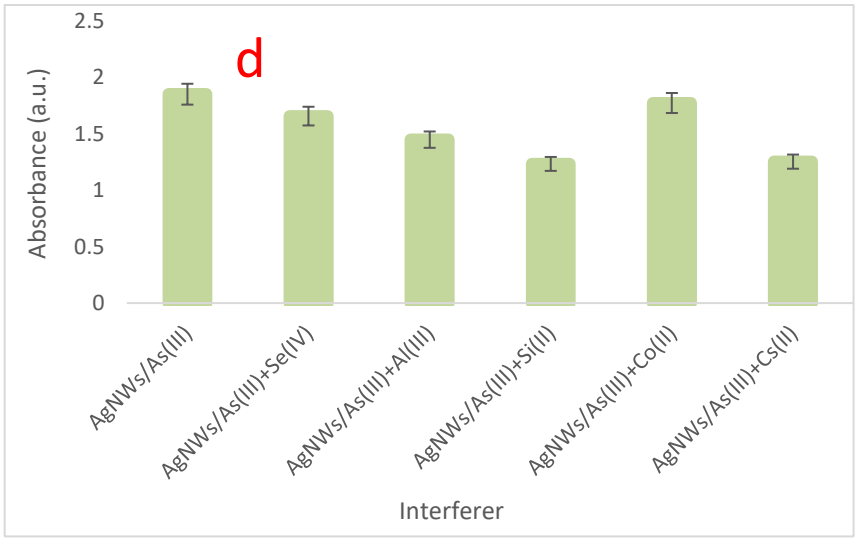
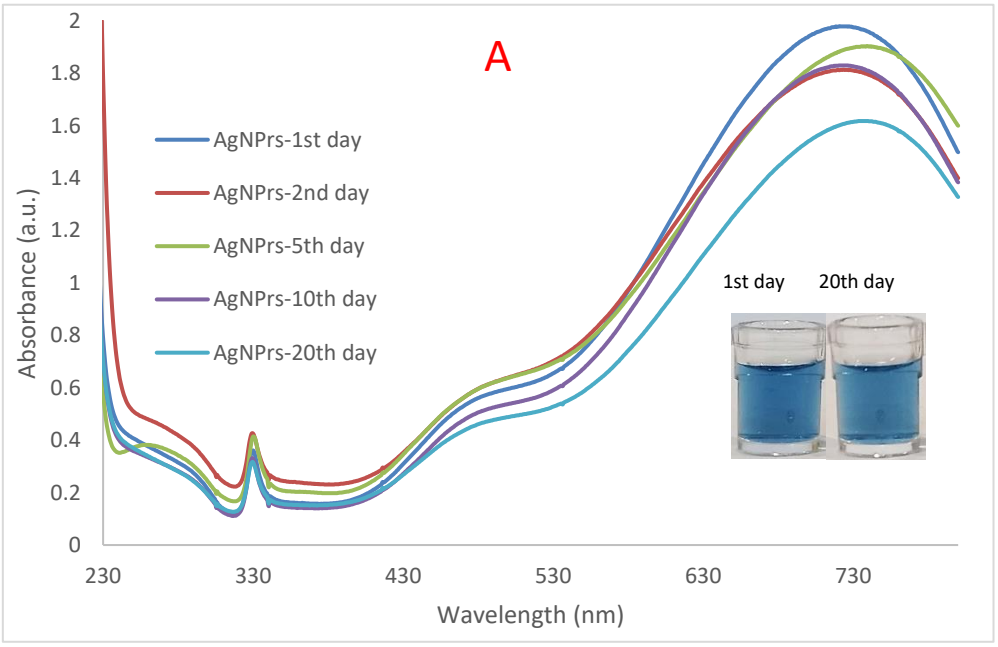
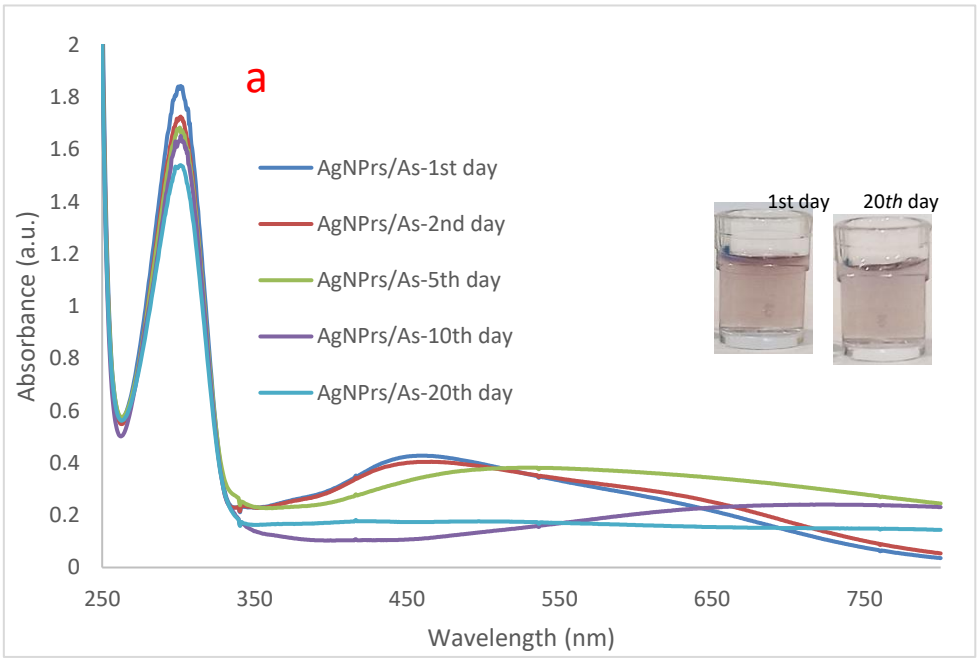
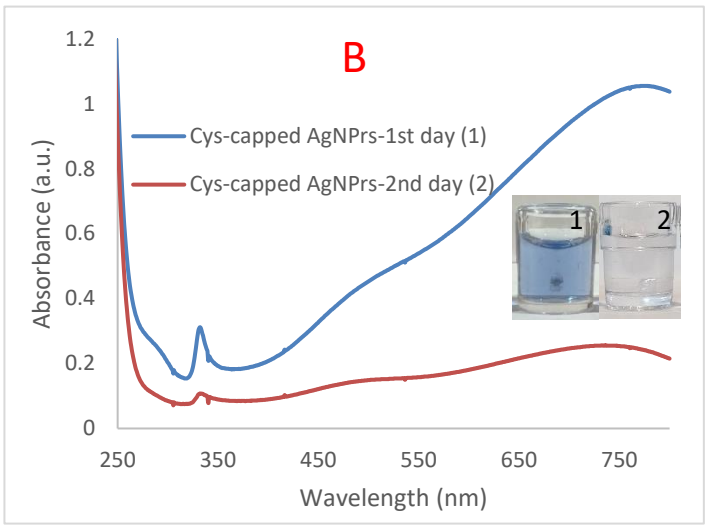
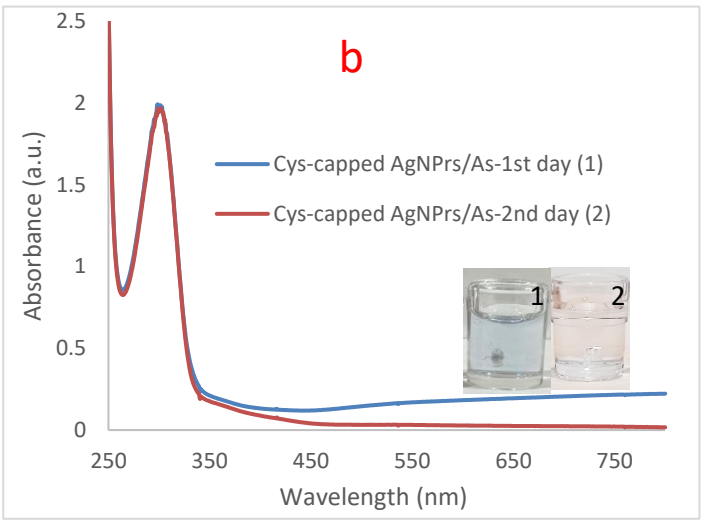


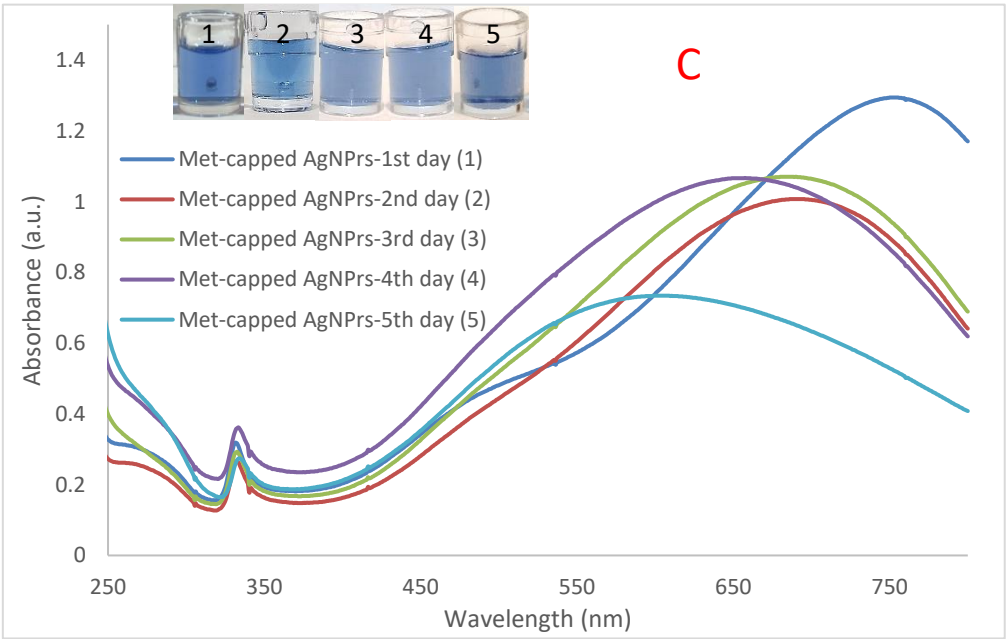
Figure S23. *Selectivity of AgNPrs* ***(A)****, Cys-capped AgNPrs* ***(B)****, Met-capped AgNPrs* ***(C)*** *and AgNWs* ***(D)*** *sensing probes to detect ion of As (III) in the presence of other metal ions and histogram of absorbance and wavelength versus type of interfere ions.*


A
AgNPrs-1st day
AgNPrs-2nd day
AgNPrs-5th day
AgNPrs-10th day
AgNPrs-20th day
Absorbance (a.u.)
Wavelength (nm)
1st day
20th day


a
AgNPrs/As-1st day
AgNPrs/As-2nd day
AgNPrs/As-5th day
AgNPrs/As-10th day
AgNPrs/As-20th day
Absorbance (a.u.)
Wavelength (nm)
1st day
20th day


B
Absorbance (a.u.)
Wavelength (nm)
Cys-capped AgNPrs-1st day (1)
Cys-capped AgNPrs-2nd day (2)
1
2


b
Absorbance (a.u.)
Wavelength (nm)
Cys-capped AgNPrs/As-1st day (1)
Cys-capped AgNPrs/As-2nd day (2)
1
2


C
Absorbance (a.u.)
Wavelength (nm)
Met-capped AgNPrs-1st day (1)
Met-capped AgNPrs-2nd day (2)
Met-capped AgNPrs-3rd day (3)
Met-capped AgNPrs-4th day (4)
Met-capped AgNPrs-5th day (5)
1
2
3
4
5

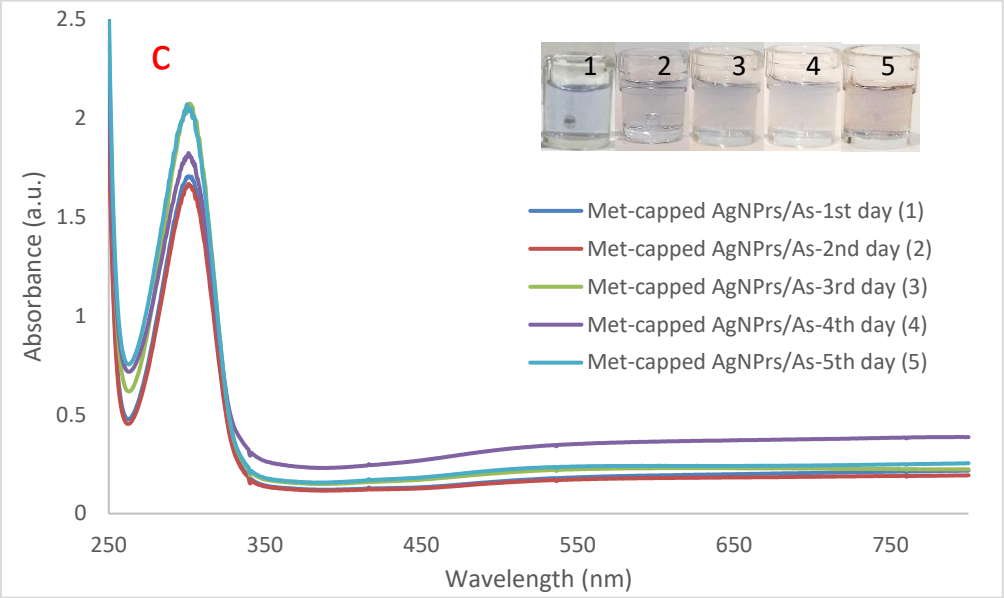


Figure S24. *Stability of sensing probe: AgNPrs* ***(A)*** *and AgNPrs in the prescence of As (III)* ***(a)****, Cys-capped AgNPrs* ***(B)*** *and Cys-capped AgNPrs in the prescence of As (III)* ***(b)****, Met-capped AgNPrs* ***(C)*** *and Met-capped AgNPrs in the prescence of As (III)* ***(c)****.*

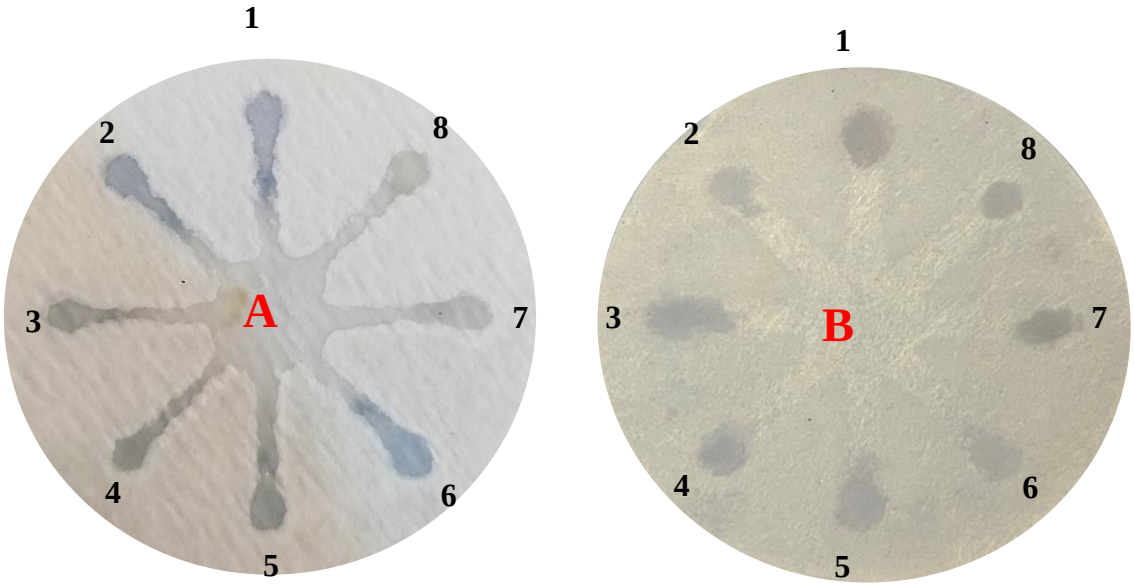


Figure S25. *Comparison of paper types for the preparation of microfluidic paper chips (Zones 1 to 8 are associated with AgNPrs, Cys-capped AgNPrs, AgNPrs/As, Cys-capped Ag NPrs/As, Met-capped AgNPrs/As, Met-capped AgNPrs, AgNWs, and AgNWs/As, respectively):* ***A)*** *glass fiber paper,* ***B)*** *filter paper.*

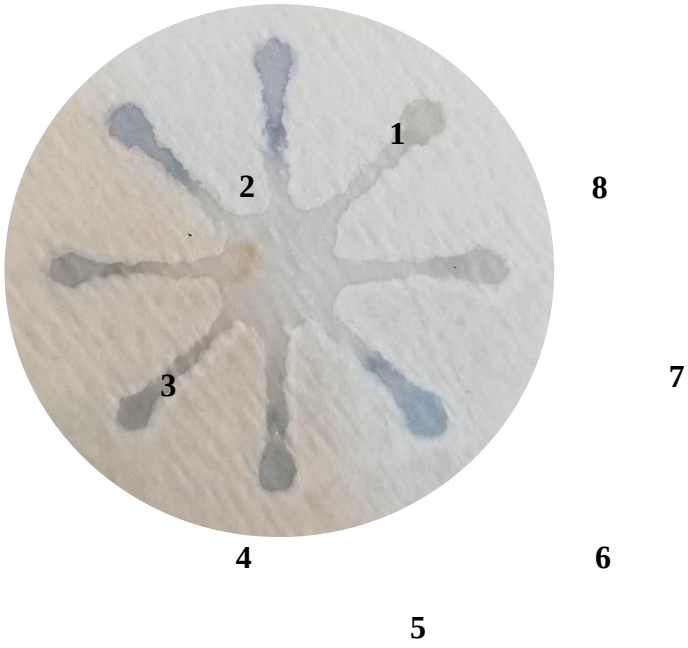


Figure S26. *Colorimetric detection of arsenic using proposed sensing probes in paper-based microfluidic chips. (Numbers 1 to 8 are associated with AgNPrs, Cys-capped AgNPrs, AgNPrs/As, Cys-capped Ag NPrs/As, Met-capped AgNPrs/As, Met-capped AgNPrs, AgNWs, and AgNWs/As, respectively).*

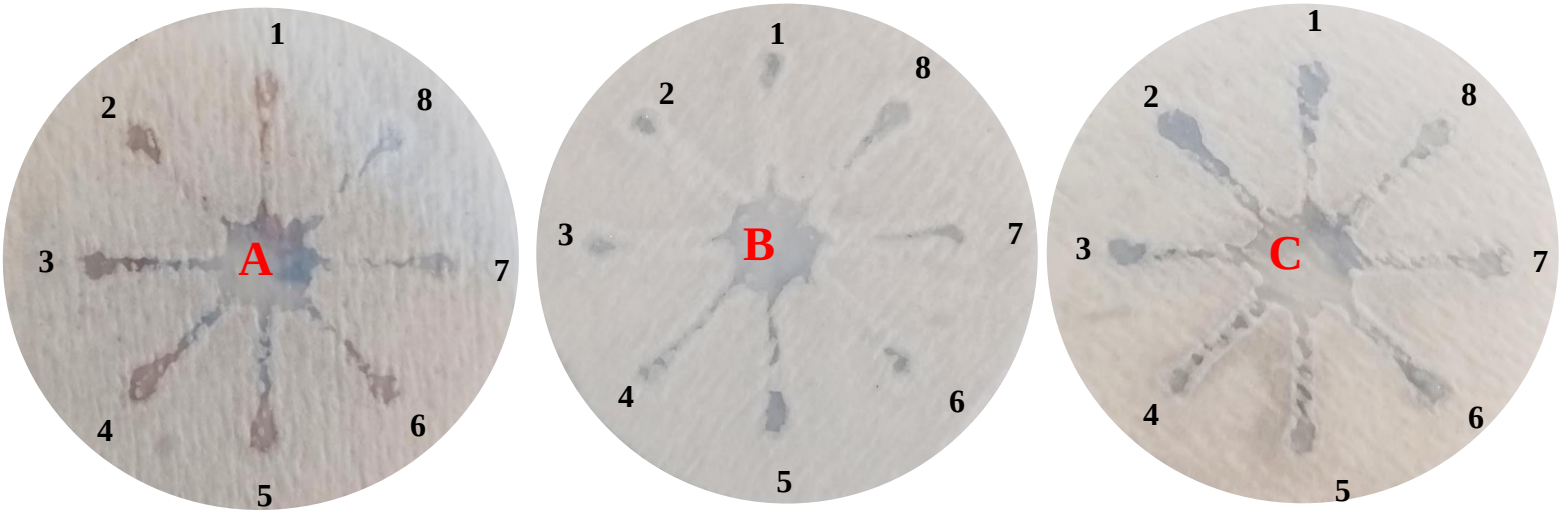


Figure S27. *Photographic images of µPADs modified by AgNPrs* ***(A)****, Cys-capped AgNPrs* ***(B)****, and Met-capped AgNPrs* ***(C)*** *sensing probes towards colorimetric detection of As (III) in lower concentrations (zones 1 to 8 corresponding to the concentrations of 1, 0.8, 0.6, 0.3, 0.1, 0.05, 0.01, and 0.0005 ppm, respectively).*

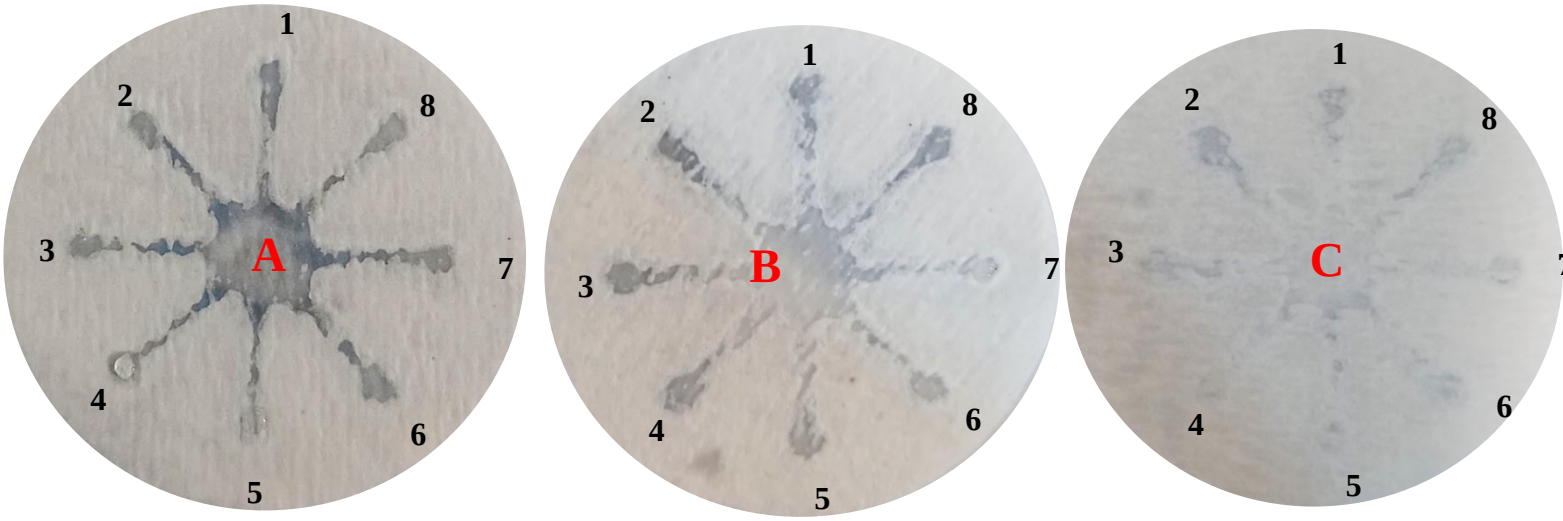
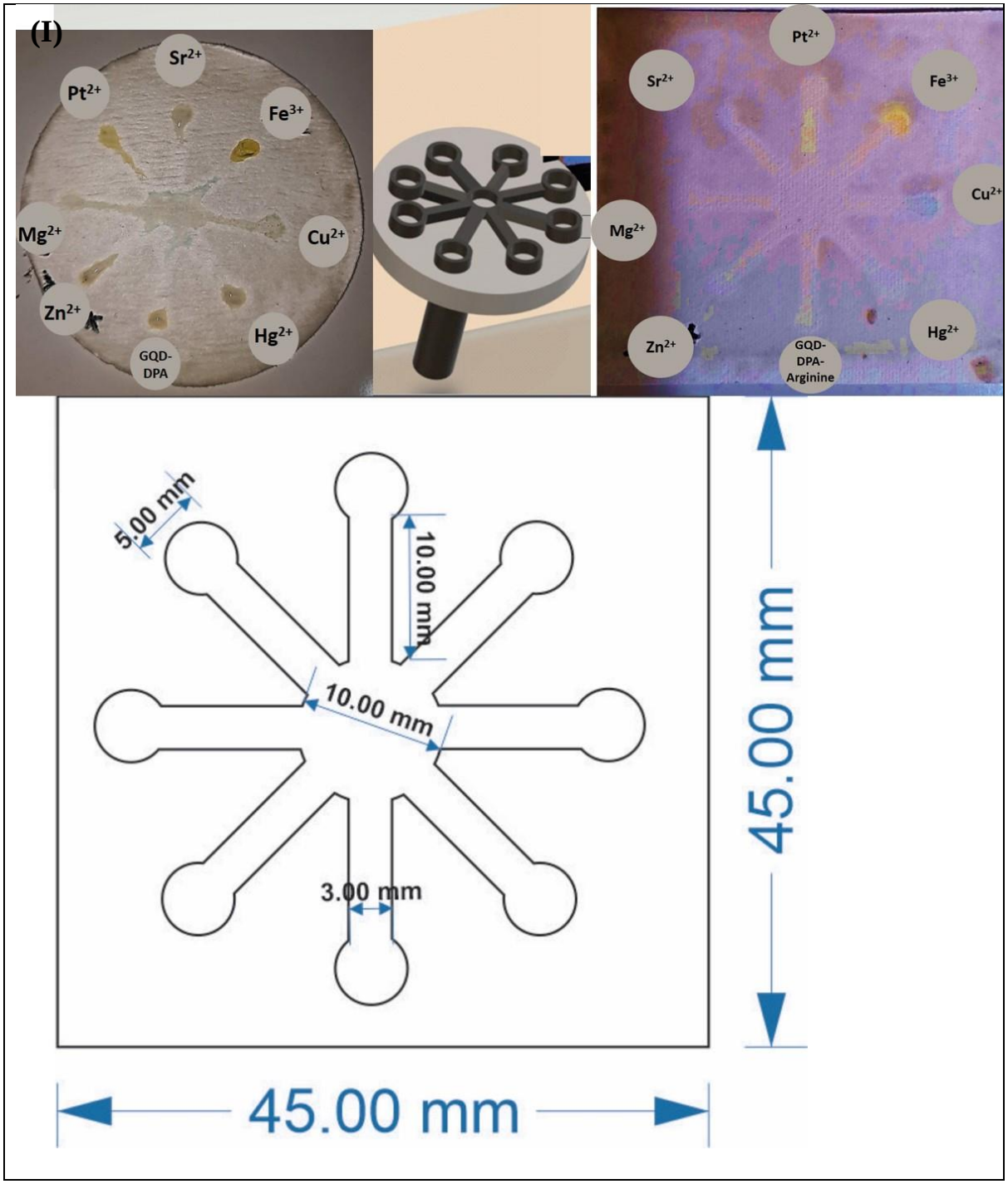
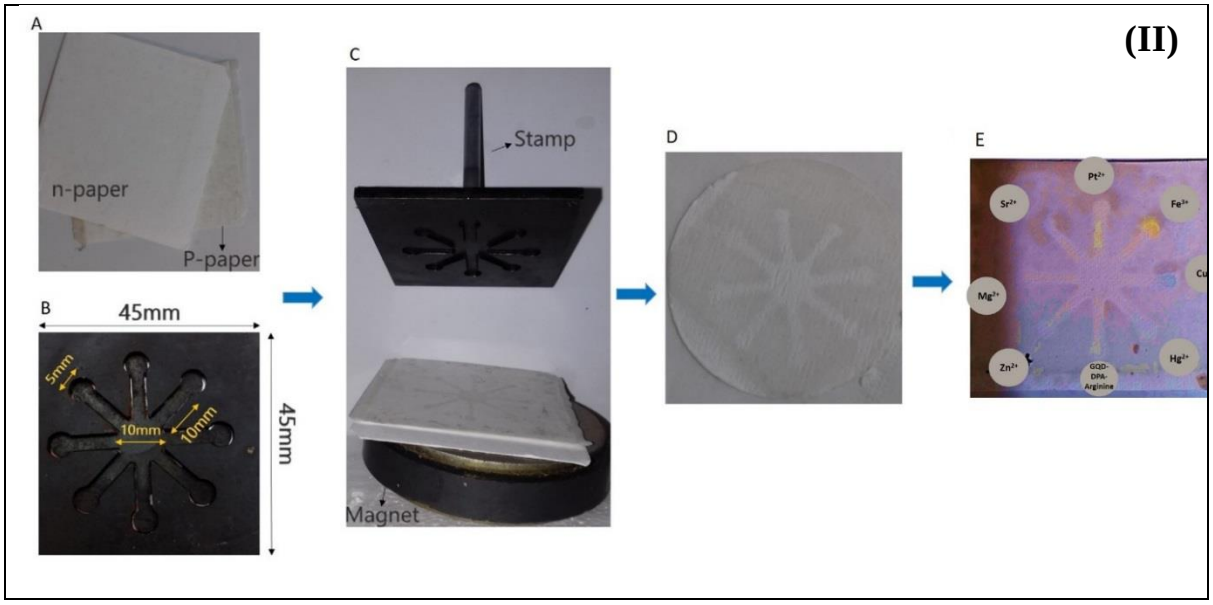


Figure S28. *Photographic images of µPADs modified by AgNPrs* ***(A)****, Cys-capped AgNPrs* ***(B)****, and Met-capped AgNPrs* ***(C)*** *sensing probes towards colorimetric detection of As (III) spiked in human urine samples in lower concentrations (zones 1 to 8 corresponding to the concentrations of 1, 0.8, 0.6, 0.3, 0.1, 0.05, 0.01, and 0.0005 ppm, respectively).*

Table S1. *Analytical parameters of As (III) detection based on proposed sensing probes in human urine samples.*

Sensing probe	**Regression equation**	**R^2**	**LLOD (ppm)**	**Linear range (ppm)**
Ag NPrs	Abs. = 0.2031 $C_{As(III)}$ + 0.6497	0.962	0.005	0.005-0.8
Cys-capped Ag NPrs	Abs. = 0.3856 $C_{As(III)}$ + 0.7273	0.9512	0.0005	0.0005-0.8
Met-capped Ag NPrs	Abs. = 0.28 $C_{As(III)}$ + 0.5425	0.9925	0.3	0.3-0.7
Ag NWs	-	-	-	-


(I)
Sr2+
Pt2+
Fe3+
Mg2+
Cu2+
Zn2+
Hg2+
GQD-DPA
Pt2+
Sr2+
Fe3+
Cu2+
Mg2+
Zn2+
Hg2+
GQD-DPA-Arginine
5.00 mm
10.00 mm
10.00 mm
3.00 mm
45.00 mm
45.00 mm



Scheme S1. Microfluidic paper-based (µPADs) colorimetric sensor, molding by a local-made hot template on the paraffin-coated paper (p-paper), through which, heat may transfer to the native paper (n-paper). The AuotoCAD dimensions of the paper (I). P-paper is put on the n-paper (A), a local made stainless steel template was prepared with dimensions d=5 mm for the peripheral circles, d=10 mm for the central circle, 10 mm for the length of the channels, and 3 mm for the width of the channels (B), The template was stamped on the papers (in contact with the p-paper) with 2kg in pressure through magnet (C), the µPADs were prepared (D), and used as the colorimetric sensor for specific detection of As (III) (E) (II).