Electronic Supplementary Material (ESI) for RSC Advances.


# Supplementary Information

## Fabrication of Ni-$Fe_2O_3$ magnetic nanorods and application to the detection of uric acid

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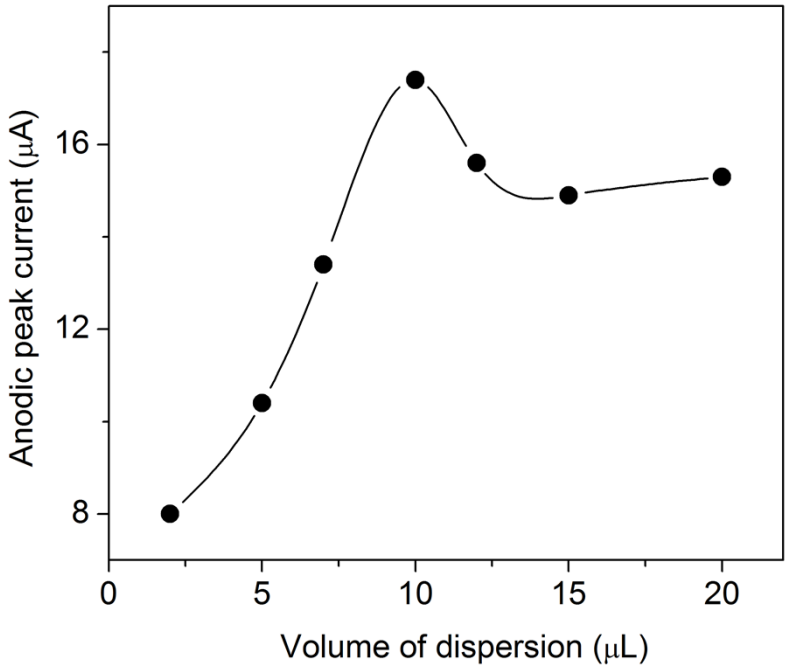


**Fig. S1**: Plot of anodic peak current of UA versus volume of sample dispersion.

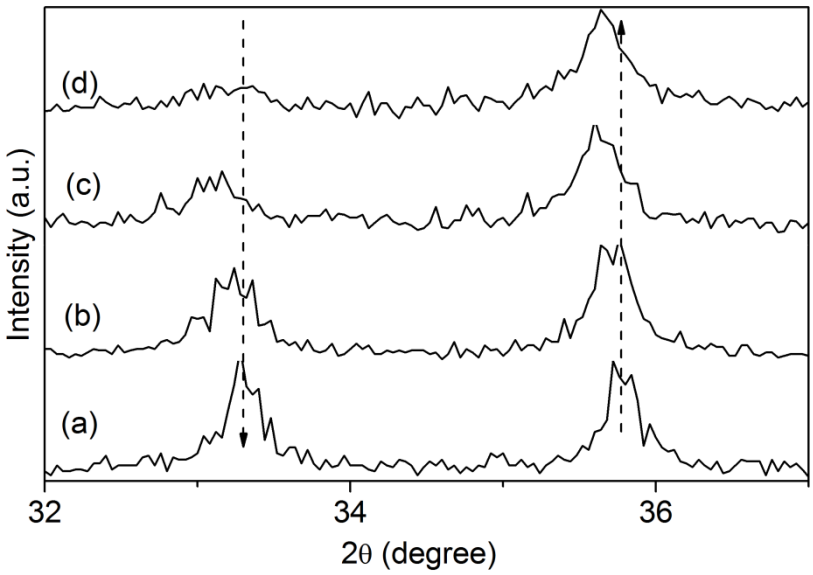


**Fig. S2**: XRD patterns of (a) $Fe_2O_3$, (b) 2%Ni-$Fe_2O_3$, (c) 5%Ni-$Fe_2O_3$, (d) 10%Ni-$Fe_2O_3$ nanorods in the range of 32.0°-37.0°.

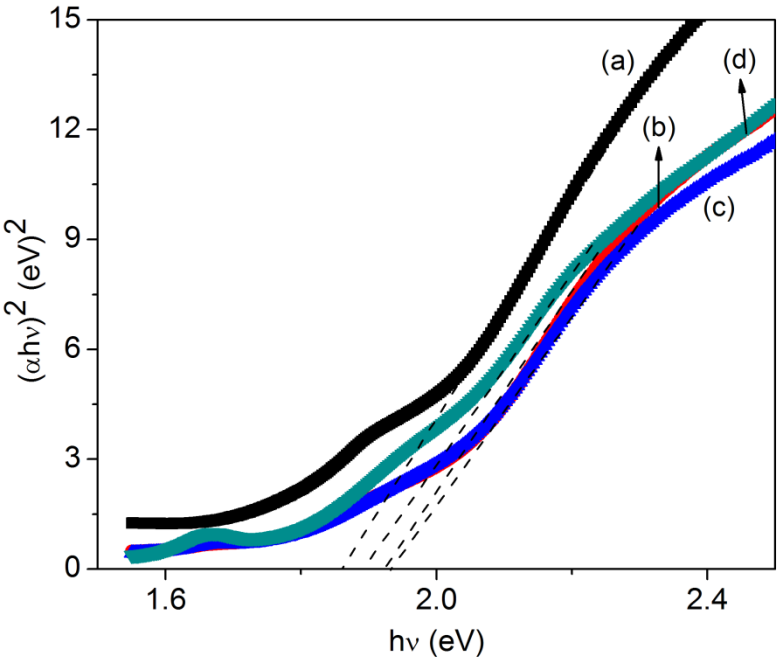


**Fig. S3**: Tauc's plot of (a) $Fe_2O_3$, (b) 2%Ni-$Fe_2O_3$, (c) 5%Ni-$Fe_2O_3$, and (d) 10%Ni-$Fe_2O_3$ nanorods.

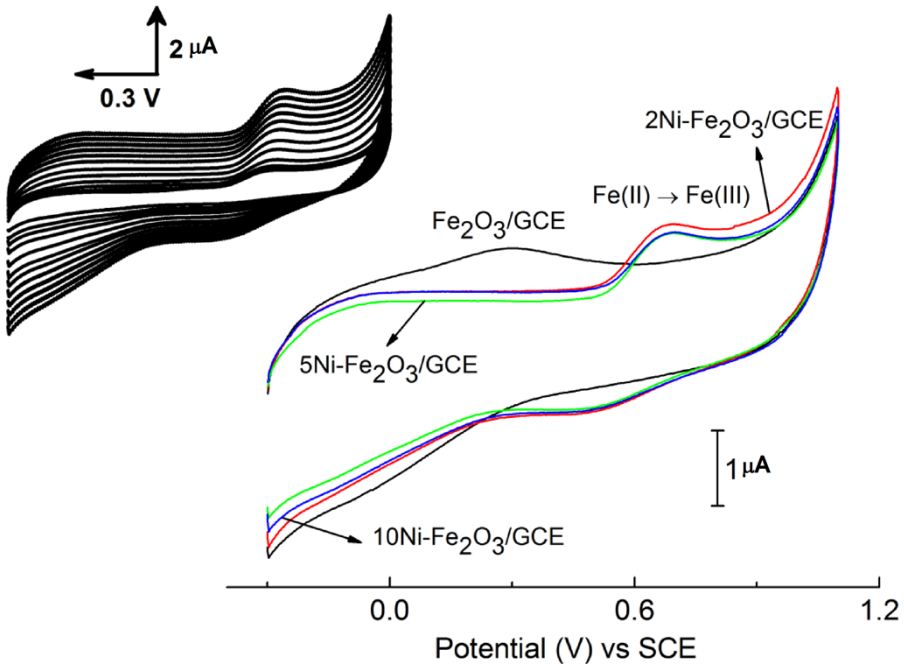


**Fig. S4**: Cyclic voltammograms of (a) bare, (b) $Fe_2O_3$/GCE, (c) 2%Ni-$Fe_2O_3$/GCE, (d) 5%Ni-$Fe_2O_3$/GCE, and (e) 10%Ni-$Fe_2O_3$/GCE in 0.1M PBS at scan rate of 50 $mVs^{-1}$. Inset Figure: Effect of scan rate on the 5%Ni-$Fe_2O_3$/GCE.

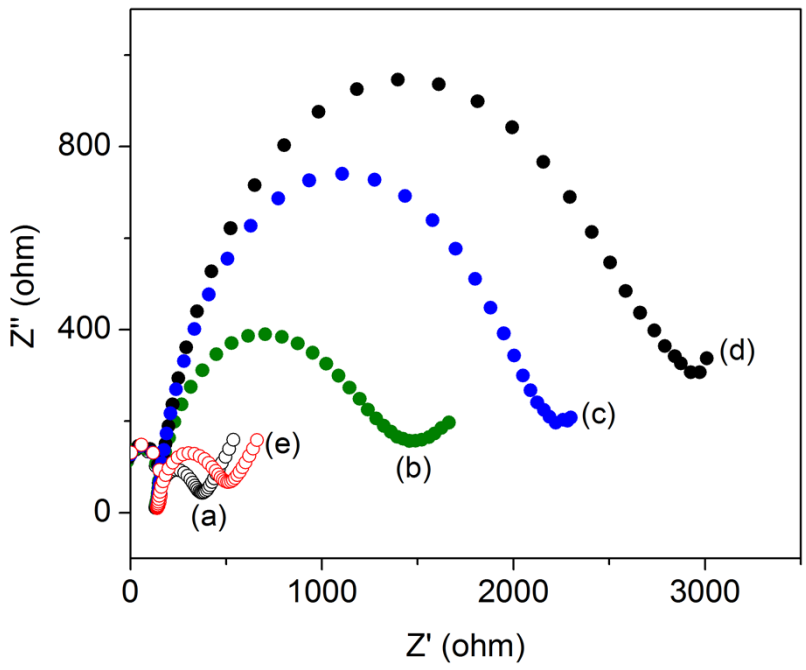


**Fig. S5**: Nyquist plots of 5 mM $K_3[Fe(CN)_6]$ at (a)bare GCE , (b)$Fe_2O_3$/GCE, (c)2Ni%-$Fe_2O_3$/GCE , (d)5Ni%-$Fe_2O_3$/GCE, and (e)10Ni%-$Fe_2O_3$/GCE. The frequency range is from 0.5 Hz to 100 kHz. The ac amplitude of 5 mV was applied.

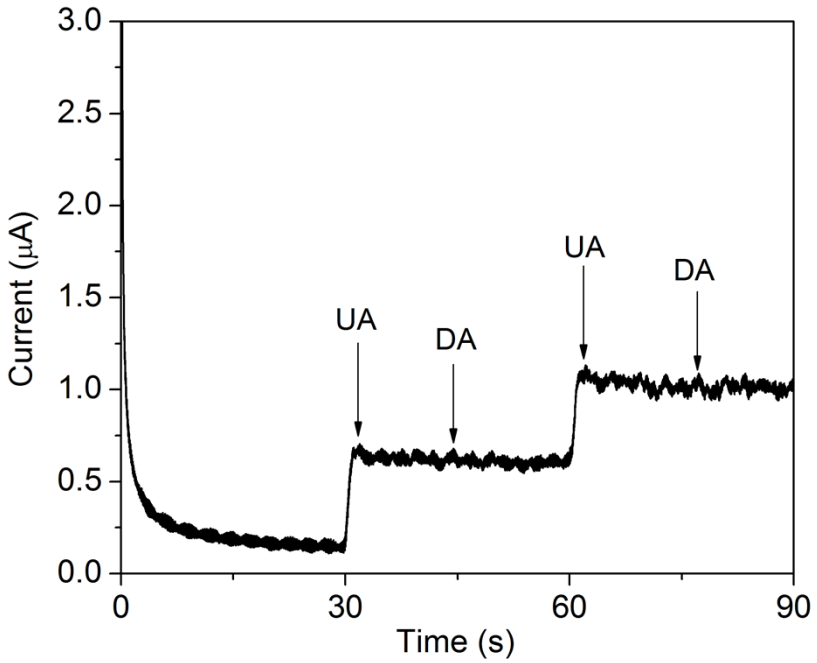


**Fig. S6:** Interference test in 0.1 M PBS (pH = 7.4) at 0.47 V with 0.01 mM UA and 1 mM DA.

**Table. S1:** Comparison of the proposed sensor with other electrochemical sensors for the determination of UA*.

| Fabricated sensor | Sensitivity ($\mu A \mu M^{-1}$) | Linear range ($\mu M$) | Detection limit ($\mu M$) | Reference |
|---|---|---|---|---|
| Uricase/MUA-MPA/AuNP/APTES/ITO | 0.0193 | 70-630 | 54.0 | [36] |
| Uricase–Th–SWNTs/GCE | 0.090 | 2-2000 | 0.5 | [37] |
| Uricase/$BS^3$/APTES/ITO | 0.039 | 50-580 | 37.0 | [38] |
| Nafion/uricase/T-ZnO/Au | 0.080 | 0.8-3490 | 0.8 | [39] |
| Uricase/Ir–C electrode | 0.1101 | 100-800 | 10.0 | [40] |
| MWCNT-PEDOT film | - | 10-250 | 10.0 | [41] |
| $SnO_2$/Pt/Ti/glass and ITO/glass electrodes | 697.16 $\mu A\ mM^{-1}$ and 165.42 $\mu A\ mM^{-1}$ | 0.05–1 mM | 0.04 mM and 0.048 mM | [42] |
| PANI-GO/GCE | 2.2 | 2–18 | 0.2 | [43] |
| BNDCNPE | - | 6.5-752.0 | 4.28 | [44] |
| 5%Ni-$Fe_2O_3$/GCE | 0.060 | 6.6-112.4 | 3.1 | This work |

* MUA: 11-mercapto undecanoic acid; MPA: 3-mercapto propionic acid;
AuNP: gold nanoparticle; APTES: 3-aminopropyltriethoxysilane; ITO: indium-tin-oxide;
Th: thionine; SWNTs: single-walled carbon nanotube; GCE: glassy carbon electrode;
$BS^3$: bis[sulfosuccinimidyl]suberate; T-ZnO: tetrapod-shaped ZnO nanostructure;
Ir‑C: Ir-modified carbon; MWCNTs: multiwalled carbon nanotubes;
PEDOT: poly-3.4-dioxoethylenethiophene film; PANI: polyaniline, GO: graphene oxide;
BNDCNPE: [1, 1'-binaphthalene]-4, 4'-dio- and carbon nanotubes paste electrode.

**Table. S2:** Determination of UA in human urine samples

| Samples | Detected (µM) | Added (µM) | Found (µM) | Recovery (%) |
|---|---|---|---|---|
| Sample-A | 10.51 | 15.0 | 25.3 | 99.2 |
| Sample-B | 9.80 | 15.0 | 25.2 | 101.6 |
| Sample-C | 11.20 | 15.0 | 25.8 | 98.5 |

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