Electronic Supplementary Material (ESI) for Analytical Methods.


## Supporting Information

# Simultaneous determination of Amlodipine and Losartan using iron metal organic framework/mesoporous carbon nanocomposite modified glassy carbon electrode by differential pulse voltammetry

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## Figures:

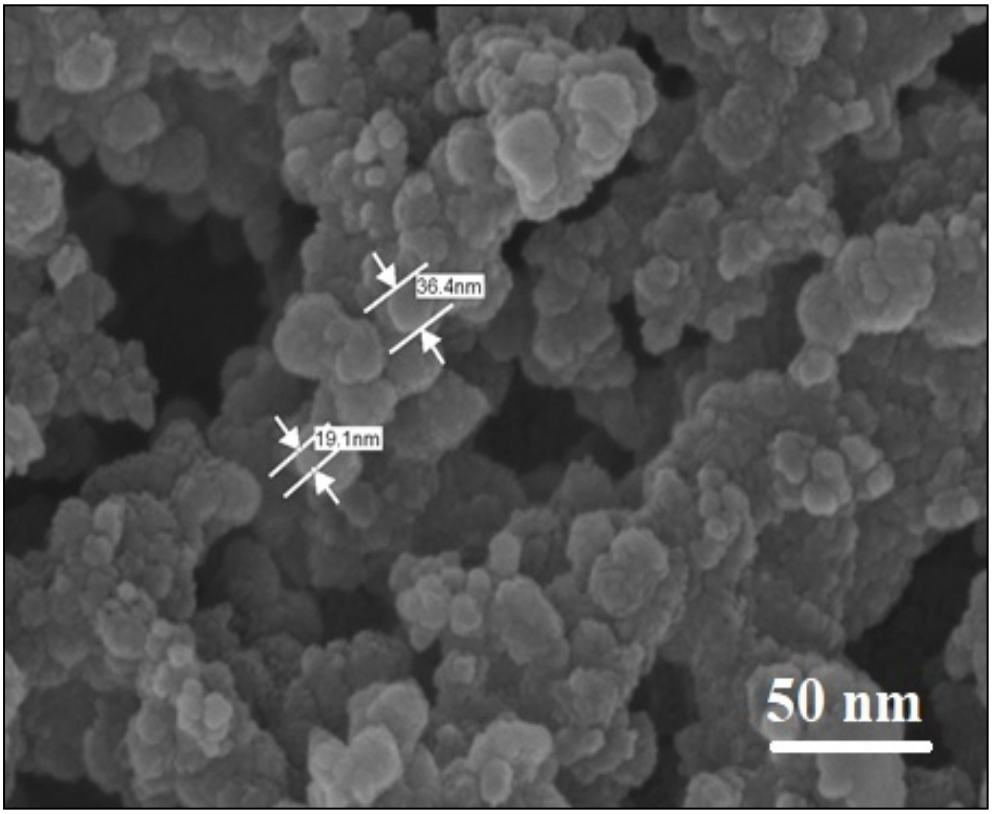


**Fig. S1** SEM image of MC showing the range of average size of the particle

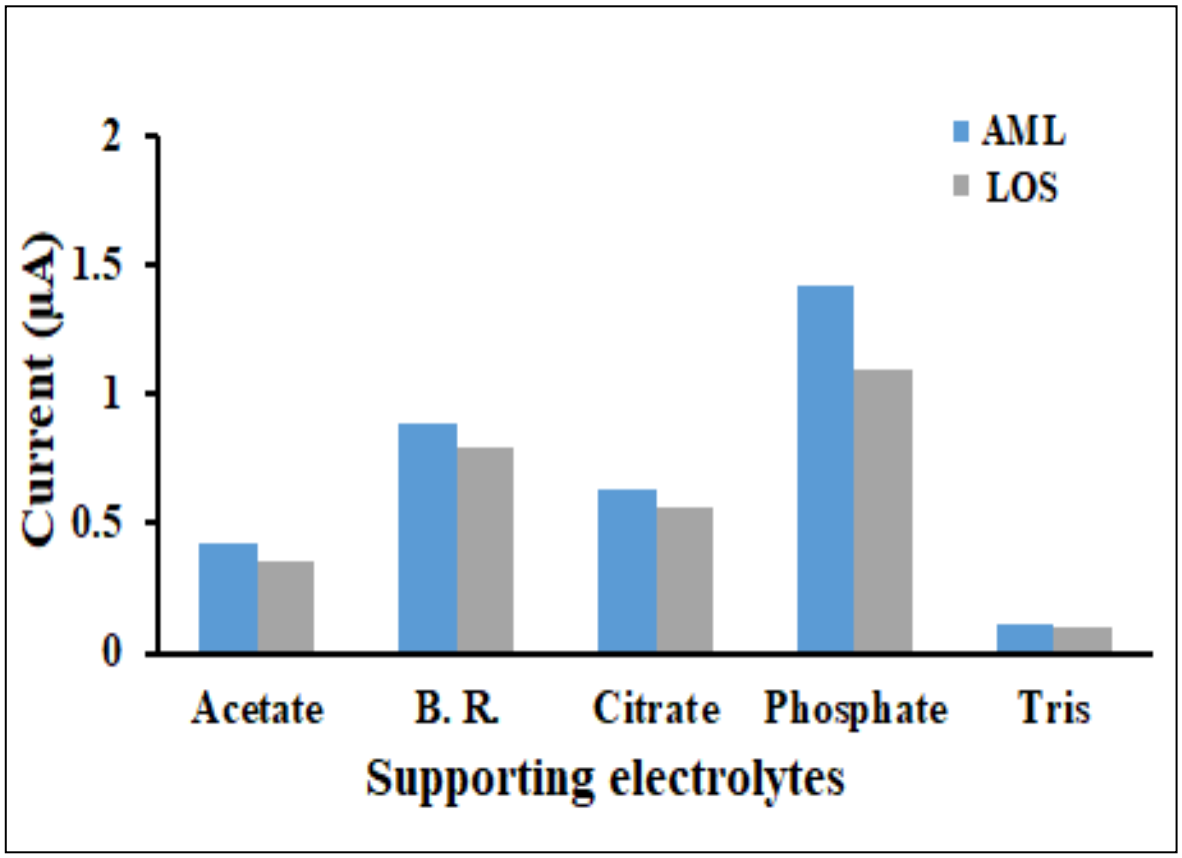


**Fig. S2** Effect of different supporting electrolytes on the electrochemical behavior of AML and LOS

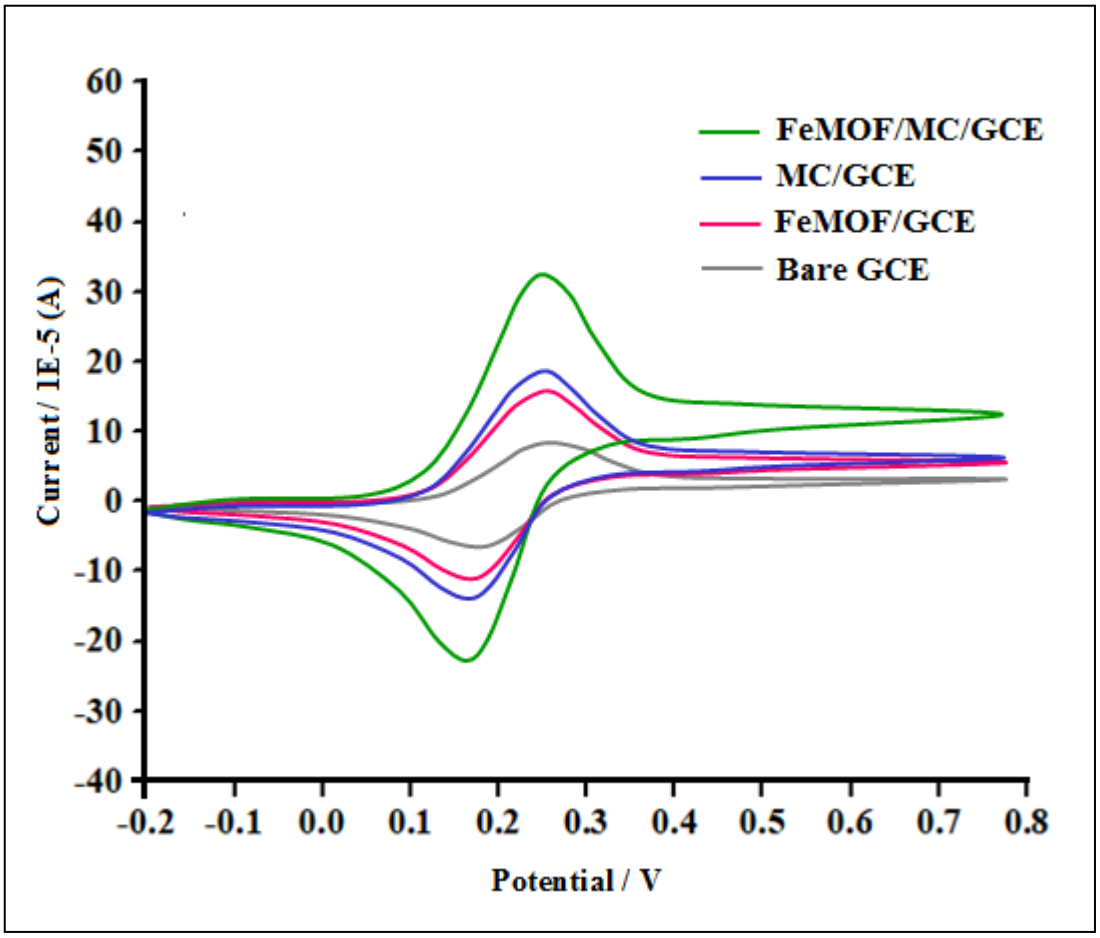


**Fig. S3** Comparison of different electrodes viz. bare GCE, FeMOF/GCE, MC/GCE and FeMOF/MC/GCE in standard $K_3[Fe(CN)_6]$ solution

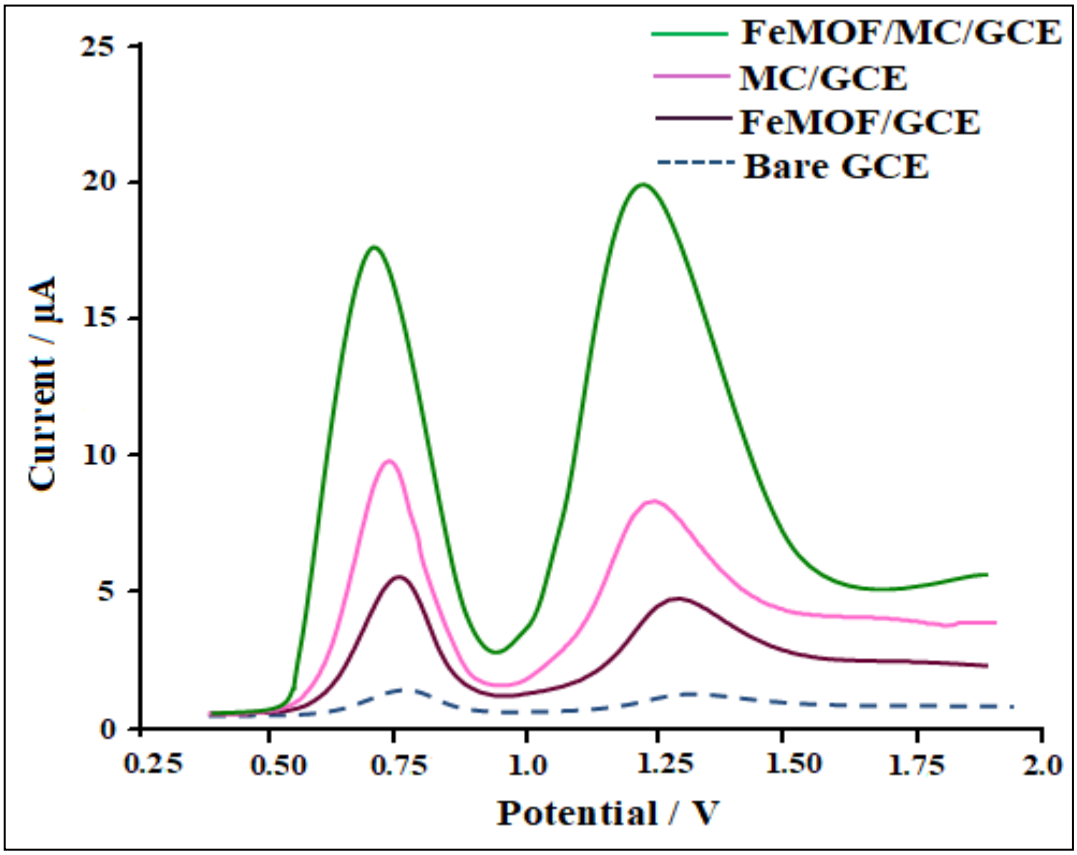


**Fig. S4** DPV curves of 7.0 x $10^{-4}$ M AML and LOS solution recorded at Bare GCE, FeMOF/GCE, MC/GCE and FeMOF/MC/GCE

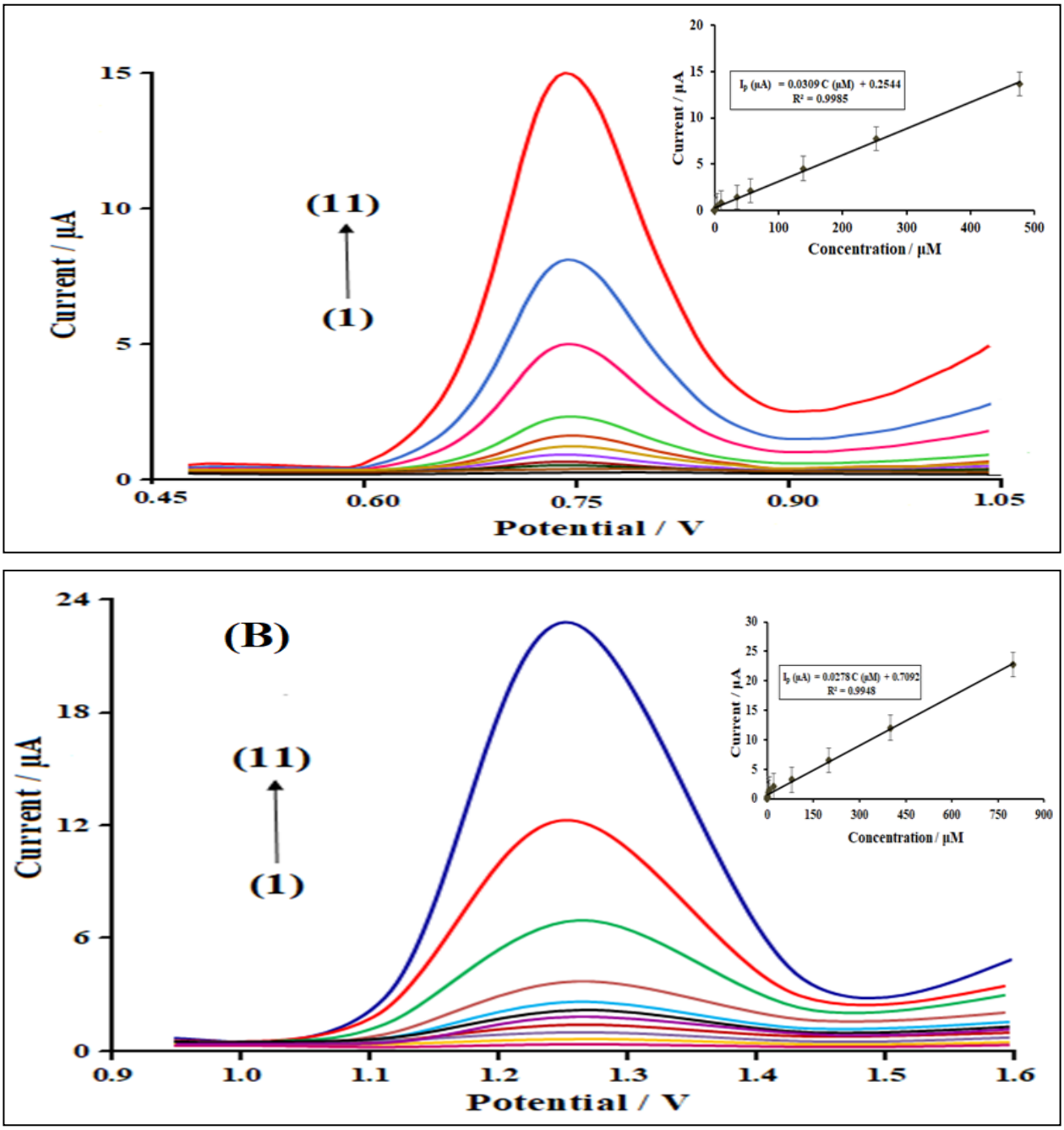


**Fig. S5(A)** DPV curves of AML in the concentration range of 0.0089 to 470 µM and the figure inset represents the calibration curve obtained for peak current ($I_p$/µA) versus concentration (µM); **(B)** DPV curves of LOS in the concentration range of 0.008 to 800 µM and the figure inset represents the calibration curve obtained for peak current ($I_p$/µA) versus concentration (µM)

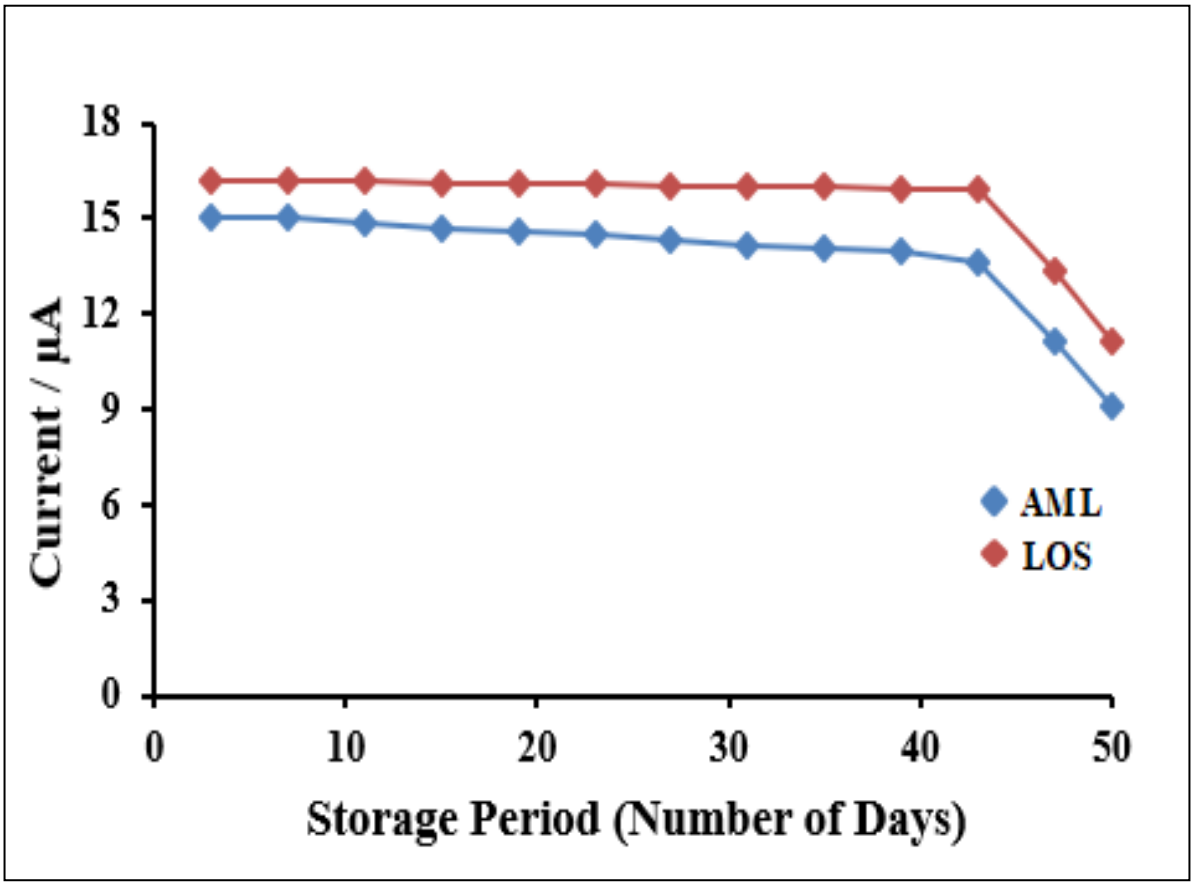


**Fig. S6** A plot of storage stability of the FeMOF/MC/GCE sensor for over 50 days

## Tables:

**Table S1.**Precision and Bias of assay for standard AML and LOS solutions by the proposed voltammetric procedure:

| Molecule | Concentration taken ($10^{-6}$ M) | Concentration found ($10^{-6}$ M) | Recovery (%) (n=5) | Bias (%) | Precision % R.S.D. (n=5) |
|---|---|---|---|---|---|
| AML | Intra day | | | | |
| | 3.5 | 3.48 | 99.42 | 0.57 | 1.12 |
| | Inter day | | | | |
| | 4.32 | 4.29 | 99.30 | 0.69 | 1.57 |
| LOS | Intra day | | | | |
| | 3.78 | 3.76 | 99.47 | 0.53 | 1.15 |
| | Inter day | | | | |
| | 4.65 | 4.62 | 99.35 | 0.64 | 1.61 |

**Table S2.** Determination of AML and LOS in tablet dosage forms by proposed method:

| Sample | AML | | LOS | |
|---|---|---|---|---|
| | Amount of drug present in the sample (mg) | Amount of drug calculated by proposed method (mg) ± %RSD (n=5) | Amount of drug present in the sample (mg) | Amount of drug calculated by proposed method (mg) ± %RSD (n=5) |
| Norvasc | 5.0 | 4.90 ± 0.42 | --- | --- |
| Norvasc | 10.0 | 9.89 ± 0.26 | --- | --- |
| Cosart 25 | --- | --- | 25.0 | 24.60 ± 0.40 |
| Covance 50 | --- | --- | 50.0 | 49.40 ± 0.24 |
| Amlokind L | 5.0 | 4.79 ± 0.98 | 50.0 | 49.57 ± 0.17 |
| Covamlo | 5.0 | 4.55 ± 1.93 | 50.0 | 49.60 ±0.17 |

**Table S3.** Recovery studies for AML and LOS in real samples

| Sample | AML | | | | LOS | | | |
|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **1** | **2** | **3** | **4** |
| **A) Pharmaceutical Formulations** | | | | | | | | |
| Norvasc (5 mg) | --- | 32.1 | --- | 99.28 ± 0.20 | --- | --- | --- | --- |
| | 19.2 | 50.8 | 99.02 | | --- | --- | --- | |
| | 37.0 | 68.6 | 99.27 | | --- | --- | --- | |
| | 53.5 | 85.2 | 99.57 | | --- | --- | --- | |
| Norvasc (10 mg) | --- | 41.2 | --- | 99.18 ± 0.33 | --- | --- | --- | --- |
| | 19.2 | 59.6 | 98.67 | | --- | --- | --- | |
| | 37.0 | 77.9 | 99.61 | | --- | --- | --- | |
| | 53.5 | 94.0 | 99.26 | | --- | --- | --- | |
| Cosart 25 | --- | --- | --- | --- | --- | 16.2 | --- | 98.72 ± 0.52 |
| | --- | --- | --- | | 15.3 | 31.0 | 98.41 | |
| | --- | --- | --- | | 22.6 | 38.1 | 98.19 | |
| | --- | --- | --- | | 29.6 | 38.8 | 99.56 | |
| Covance 50 | --- | --- | --- | --- | --- | 21.8 | --- | 99.10 ± 0.19 |
| | --- | --- | --- | | 11.5 | 32.9 | 98.79 | |
| | --- | --- | --- | | 16.9 | 38.4 | 99.22 | |
| | --- | --- | --- | | 22.3 | 43.8 | 99.31 | |
| Amlokind L | --- | 1.12 | --- | 99.56 ± 0.13 | --- | 36.3 | --- | 99.10 ± 0.11 |
| | 4.22 | 5.32 | 99.62 | | 13.6 | 49.5 | 99.19 | |
| | 8.34 | 9.40 | 99.36 | | 20.1 | 55.8 | 98.93 | |
| | 12.37 | 13.45 | 99.70 | | 26.3 | 62.1 | 99.20 | |
| Covamlo | --- | 3.21 | --- | 99.36 ± 0.10 | --- | 40.2 | --- | 98.84 ± 0.57 |
| | 2.51 | 5.69 | 99.47 | | 12.0 | 51.6 | 98.85 | |
| | 4.96 | 8.12 | 99.38 | | 15.7 | 54.8 | 98.03 | |
| | 7.36 | 10.49 | 99.24 | | 19.2 | 59.2 | 99.66 | |
| **B) Biological Fluids** | | | | | | | | |
| Blood Serum | --- | ND | --- | 98.35 ± 0.71 | --- | ND | --- | 98.83 ± 0.45 |
| | 11.7 | 11.4 | 97.43 | | 14.1 | 13.9 | 98.58 | |
| | 17.2 | 17.1 | 99.41 | | 18.5 | 18.2 | 98.37 | |
| | 22.5 | 22.1 | 98.23 | | 22.9 | 22.8 | 99.56 | |
| Urine | --- | ND | --- | 98.94 ± 0.25 | --- | ND | --- | 98.85 ± 0.33 |
| | 16.2 | 16.0 | 98.76 | | 13.7 | 13.6 | 99.27 | |
| | 23.8 | 23.5 | 98.73 | | 18.9 | 18.7 | 98.94 | |
| | 31.2 | 31.0 | 99.35 | | 24.0 | 23.6 | 98.34 | |
| Saliva | --- | ND | --- | 98.70 ± 0.21 | --- | ND | --- | 99.22 ± 0.32 |
| | 25.1 | 24.8 | 98.81 | | 16.5 | 16.3 | 98.78 | |
| | 37.0 | 36.6 | 98.92 | | 24.4 | 24.2 | 99.18 | |
| | 48.5 | 47.7 | 98.35 | | 32.0 | 31.9 | 99.7 | |

* ND – Not detected; 1: Standard drug (AML/LOS) added ($10^{-6}$ M); 2: Drug (AML/LOS) found ($10^{-6}$ M); 3: Recovery (%); 4: Average Recovery (%) ±RSD

**Table S4:** Comparison of developed sensors with previously reported MOF based electrochemical sensors for the determination of organic molecules:

| No. | Target Analyte | Modified Electrode | Limit of Detection (µM) | Reference |
|---|---|---|---|---|
| 1 | Lead | Mn(TPA)/SWCNT/GCE | 0.038 | 31 |
| 2 | Hydrazine<br>Nirtobenzene | CoMOF/MPC/GCE | 1.75<br>0.27 | 32 |
| 3 | Glucose | NiMOF/GCE | 0.25 | 33 |
| 4 | Urea | NiMOF/MWCNT/ITO | 3.0 | 34 |
| 5 | Hydrogen peroxide<br>Hydrazine | MIL-100(Fe)/LMC/GCE | 1.2<br>0.213 | 35 |
| 6 | Hydrogen peroxide<br>NADH | CuMOF/MPC/GCE | 3.2<br>6.52 | 36 |
| 7 | Hydroquinone<br>Catechol<br>Resorcinol | $Cu_3(btc)_2$/CS/ERGO/GCE | 0.44<br>0.41<br>0.33 | 37 |
| 8 | Nitrite<br>Nitrobenzene | GC/Au/ZnMOF | 1.0<br>15.3 | 38 |
| 9 | AML<br>LOS | FeMOF/MC/GCE | 0.00127<br>0.00203 | This study |

*GC and GCE: Glassy carbon electrode; MOF: Metal organic framework; TPA: Terephthalic acid; SWCNT: Single walled carbon nanotubes; MPC: Macroporous carbon; MWCNT: Multi walled carbon nanotubes; ITO: Indium tin oxide glass; MIL-100(Fe): Fe based MOF; LMC: Large mesoporous carbon; $Cu_3(btc)_2$: Cu based MOF; CS: Chitosan; ERGO: Electrochemically reduced graphene oxide; Au/ZnMOF: Gold nanoparticles incorporated ZnMOF