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Supplementary Information

A fascinating multitasking *Cu-MOF/rGO* hybrid for high performance supercapacitor and highly sensitive and selective electrochemical nitrite sensor

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Optimization of relative amounts of Cu-MOF and rGO and mass loading on to the GCE

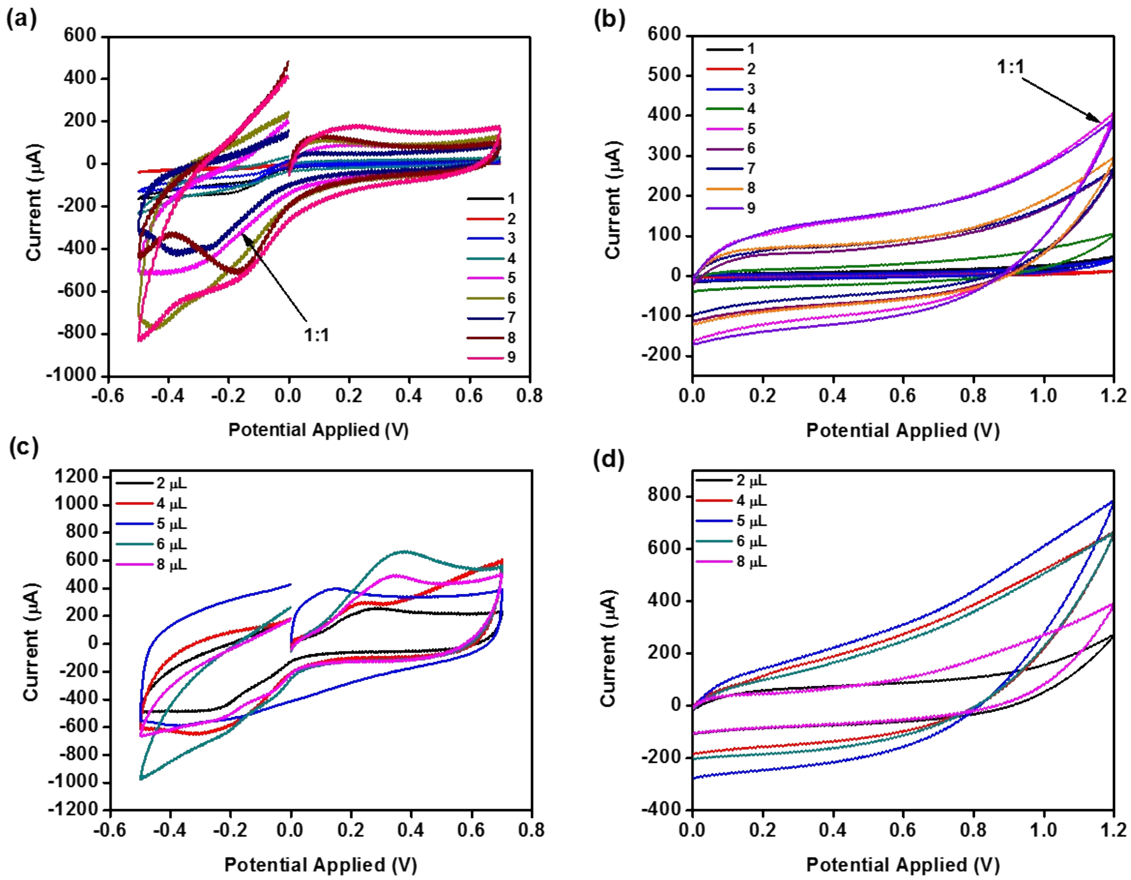

Fig. S1 (a, b) CV profiles of *Cu-MOF/rGO/GCE* prepared by acquiring 9 different relative amounts of Cu-MOF and rGO i.e. ((1) 90% Cu-MOF/10% rGO, (2) 80% Cu-MOF/20% rGO, (3) 70% Cu-MOF/30% rGO, (4) 60% Cu-MOF/40% rGO **(5) 50% Cu-MOF/50% rGO** (6) 40% Cu-MOF/60% rGO, (7) 30% Cu-MOF/70% rGO, (8) 20% Cu-MOF/80% rGO and (9) 10% Cu-MOF/90% rGO) for both supercapacitor and nitrite sensor in 1 M Na_2SO_4 and 0.1 M PBS, respectively and (c, d) CV profiles of *Cu-MOF/rGO/GCE* for different mass loadings for both supercapacitor and nitrite sensor in 1 M Na_2SO_4 and 0.1 M PBS, respectively.

Calculation of Supercapacitor Parameters

The discharge capacitance from chronopotentiometry was calculated by the following equation.[1]

$$Discharge\ Capacitance = \frac{I}{m} \times \frac{dt}{dv}$$

Where I the discharge current in ampere (A), m is the mass of the active material deposited on the GCE and dt/dv is the slope inverse of the discharge curve.[1]

The maximum energy density values were calculated from the following equation:

$$Energy\ Density = \frac{1}{2} \times (Discharge\ Capacitance) \times Vi^2$$

Where V_i is the initial voltage of the discharge curve. [1]

The power density was calculated using the following equation:

$$Power\ Density = \frac{Energy\ Density}{\Delta t}$$

Here Δt is the time of discharge.

Table S1. Crystal data and structure refinement for Cu-MOF.

empirical formula	$C_6\ H_2\ Cu\ O_5$
formula weight	217.62
crystal system	Cubic
space group	*F*m-3m
a (Å)	26.3504(6)
b (Å)	26.3504(6)
c (Å)	26.3504(6)
α (deg)	90
β (deg)	90
γ (deg)	90
V (Å^3)	18296.2(12)
Z	48
temperature (K)	293(2)
θ range	3.092 to 24.972
goodness-of-fit	1.190
R1	0.0324
wR2	0.0923
F(000)	5136
CCDC	1496503

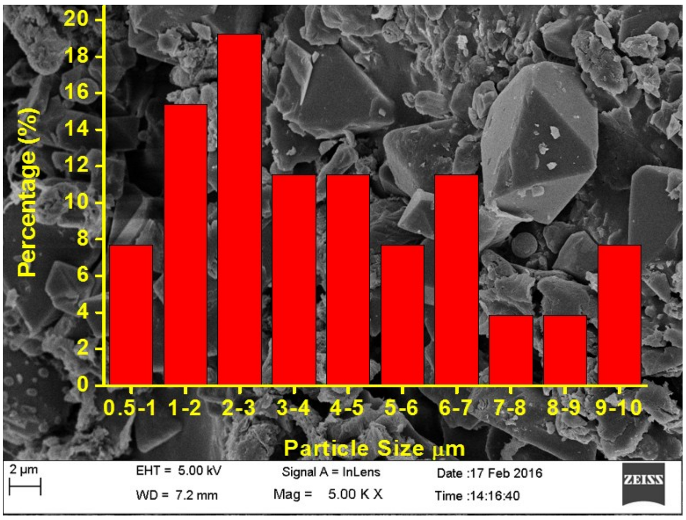

Fig. S2 Histogram of Cu-MOF crystals size distribution in Cu-MOF/rGO hybrid.

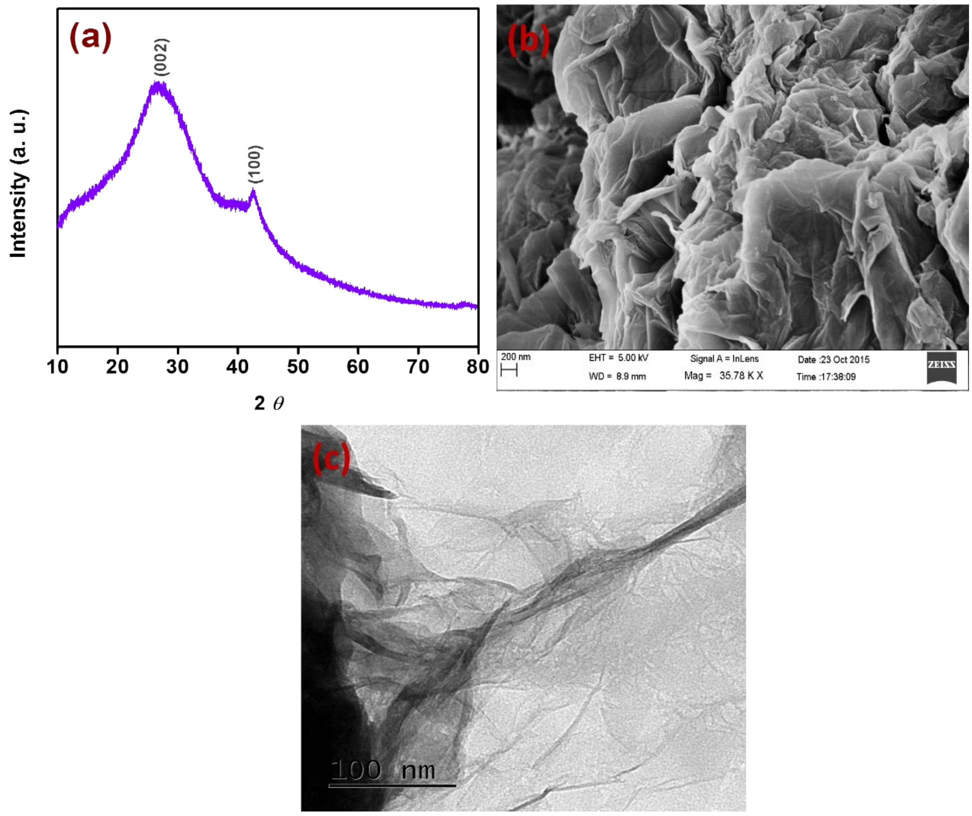

Fig. S3 (a) PXRD pattern of rGO, (b) SEM image of rGO and (c) TEM image of rGO.

Fig. S3a shows the x-ray diffraction pattern of bare rGO. The peaks emerged at 2θ = ~25° and ~43° correspond to (002) and (100) planes respectively and verifies the formation of rGO phase.[2] The FESEM image of rGO as shown in Fig. S3b, exhibits wrinkled crinkly type structure. Enhanced electrochemical performance can be expected from this type of morphology because it can possibly prevents restacking among rGO sheets and the presence of wrinkles upon these structures markedly improves the ion transportation on electrode surface due to shortening the ion diffusion path.[3,4] TEM image further reveals the formation of thin rGO sheets and suggesting the crinkly wrinkled structures (Fig. S3c).

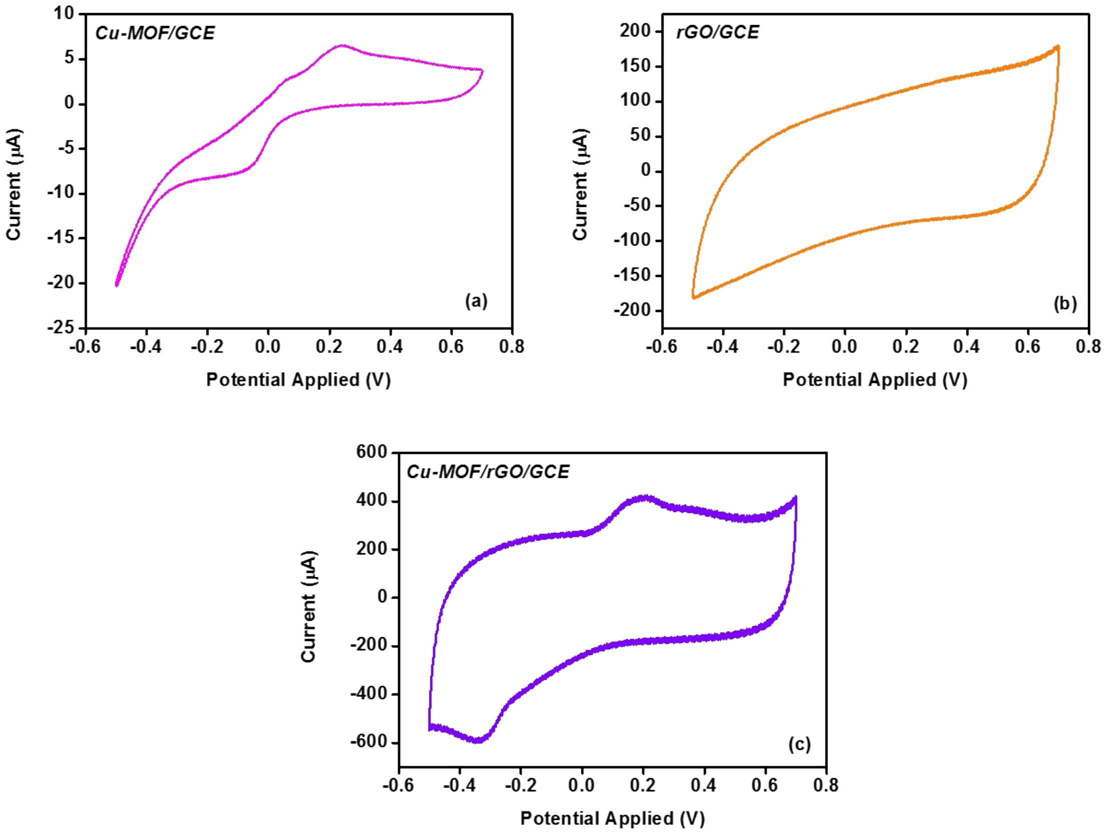

Fig. S4 CV profiles of (a) *Cu-MOF/GCE*, (b) *rGO/GCE* and (c) *Cu-MOF/rGO/GCE* at a scan rate of 75 mV s^{-1}.

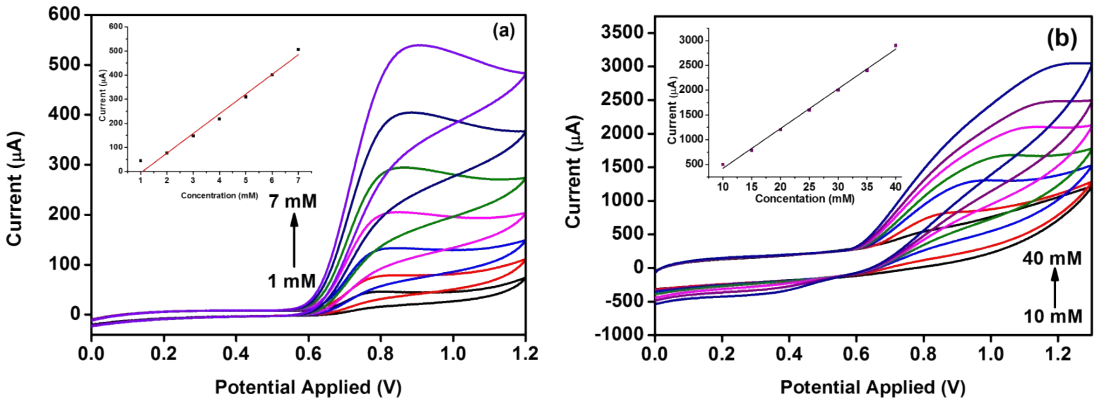

Fig. S5 (a, b) CV profiles of *Cu-MOF/rGO/GCE* at higher range of injected concentration of nitrite, where inset shows the calibration plot between current and concentration.

Table S2. Determination results of nitrite in real sample.

Sample	Nitrite concentration in the unspiked sample (mM)	Known spike added concentration (mM)	Analyte concentration in the spiked sample (mM)	Recovery (%)
Pond Water	0	0.5	0.575	115
	0	1	1.20	120
	0	1.5	1.785	119
	0	2	2.4	120
	0	2.5	2.96	118.4
	0	3	3.5	116.69
	0	3.5	4.059	116

References

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