

Electronic Supplementary Materials (ESI)

Stable MOF@Enzyme Composites for Electrochemical Biosensing Devices

Ruhani Singh*, Mustafa Musameh, Yuan Gao, Berkay Ozcelik, Xavier Mulet, and Cara M. Doherty

CSIRO Future Industries, Private Bag 10, Clayton South, Victoria 3169, Australia
*email: ruhani.singh@csiro.au

Supplementary Figures

1. Elemental analysis (EDS):

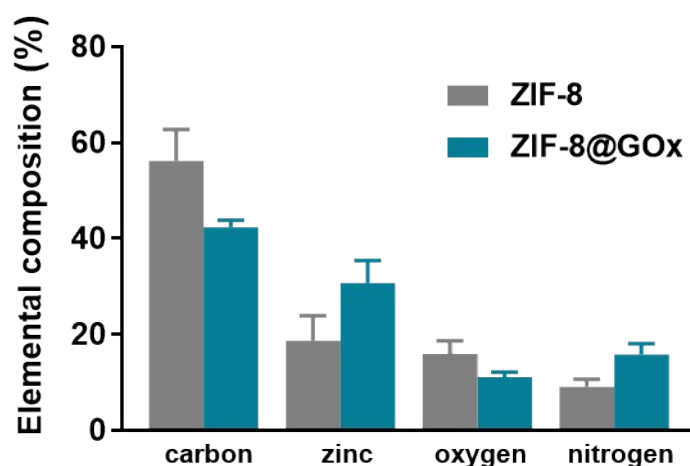


Figure S1. Elemental analysis of ZIF-8 control and ZIF-8@GOx performed using energy dispersive X-ray spectroscopy analysis (EDS) indicated no significant difference between their elemental composition.

2. GOx loading:

Figure S2 and Table S1 summarise the calculations for determine enzyme loading in the ZIF-8@GOx composite. GOx loading in ZIF-8@GOx was determined by drying multiple 1 mL aliquots of as synthesized, ZIF-8@GOx MOF. The mean dry mass of each ZIF-8@GOx aliquot was measured to be 4.6 mg. The samples were diluted 400 times in either (a)

PBS (pH 7.4) or (b) Sodium citrate buffer (50mM, pH 5.0) or (c) water. Each sample was spectrophotometrically analysed for GOx activity using the standard enzyme assay. The absorbance value from each sample was used to calculate corresponding GOx concentration for each sample using the standard curve (460 nm) for GOx derived beforehand.

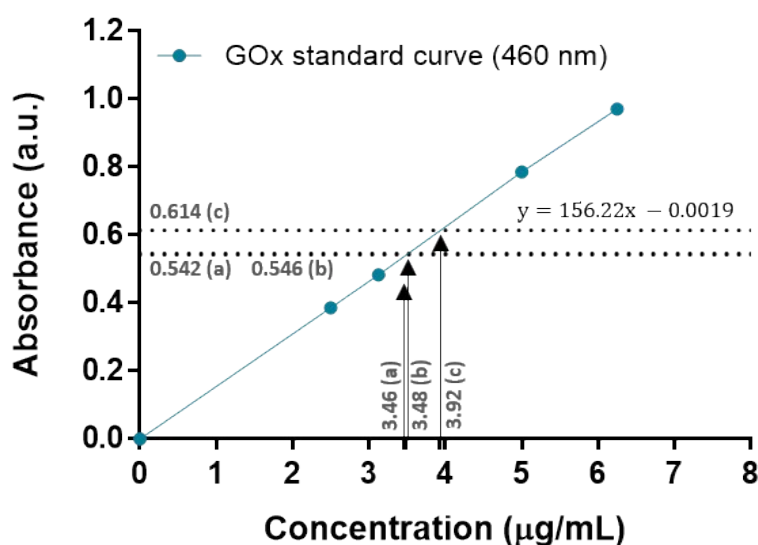


Figure S2. Active enzyme loading in the ZIF-8@GOx composite was determined by measuring the enzyme activity in each sample to determine enzyme content per unit mass of the MOF using the standard curve for GOx at 460 nm.

Table S1

Dilution buffer	Dilution factor (DF)	Absorbance (460 nm)	GOx Conc. (µg/mL)	Total GOx in sample (x DF) (mg/mL)	% Loading (Amount of Gox /Amount of MOF) x 100
(a) Water	400	0.543	3.46	1.385	30.1
(b) Sodium Citrate	400	0.546	3.48	1.394	30.3
(c) PBS	400	0.615	3.92	1.569	34.1

3. Brunauer-Emmett-Teller (BET) Isotherms:

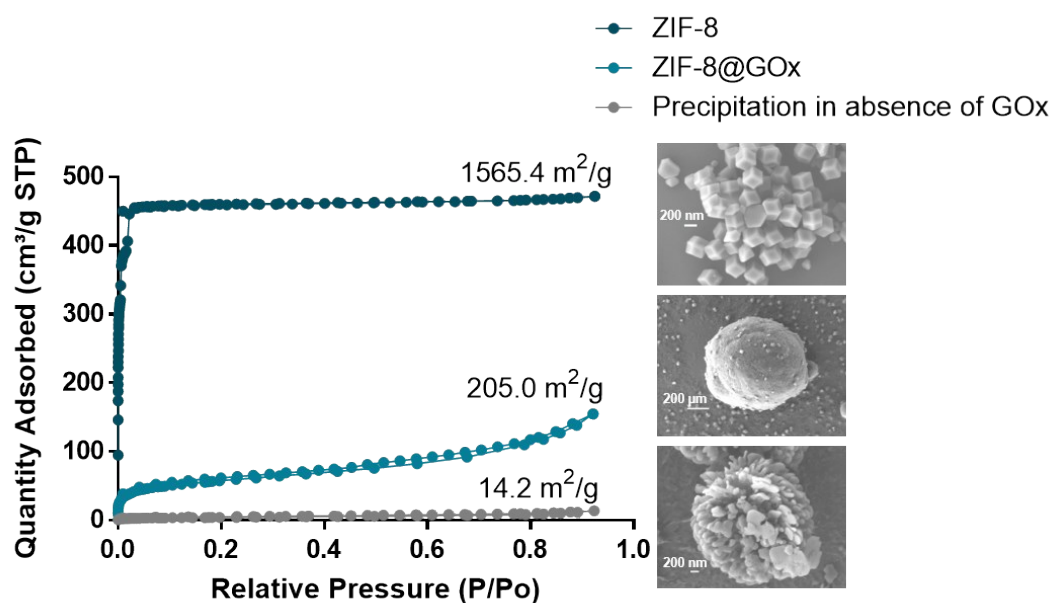


Figure S3: Figure shows the BET adsorption and desorption profiles for the three composites; (a) ZIF-8 (control, standard synthesis), (b) ZIF-8@GOx and (c) precipitation in absence of GOx. The water based synthesis instead of methanol for ZIF-8@GOx and the presence of enzyme molecules could be some of the contributing factors for the much lower surface area i.e. 205 m²/g relative to 1565 m²/g for ZIF-8. Right hand side shows corresponding SEM images for the 3 composites.

4. Effect of serum in electrolyte on biosensor current

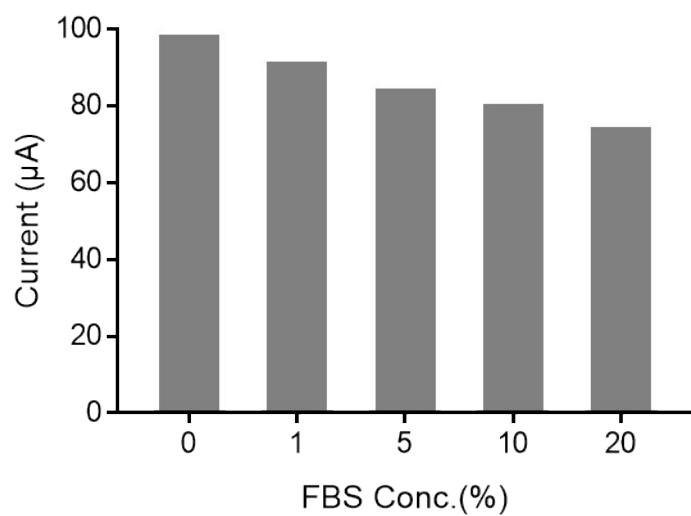


Figure S4. The reduction in current (%) in presence of 10mM glucose as a function of different concentrations of fetal bovine serum measured using a GC/MW/PB/ZIF-8@GOx biosensor at -0.05 V (vs Ag/AgCl). Supporting electrolyte; 0.05 M Tris-HCl (pH 6.0).