# Electronic Supplementary Information (ESI)

# Fabrication of conductive oxidase–entrapping nanocomposite in mesoporous ceria–carbon for efficient electrochemical biosensor

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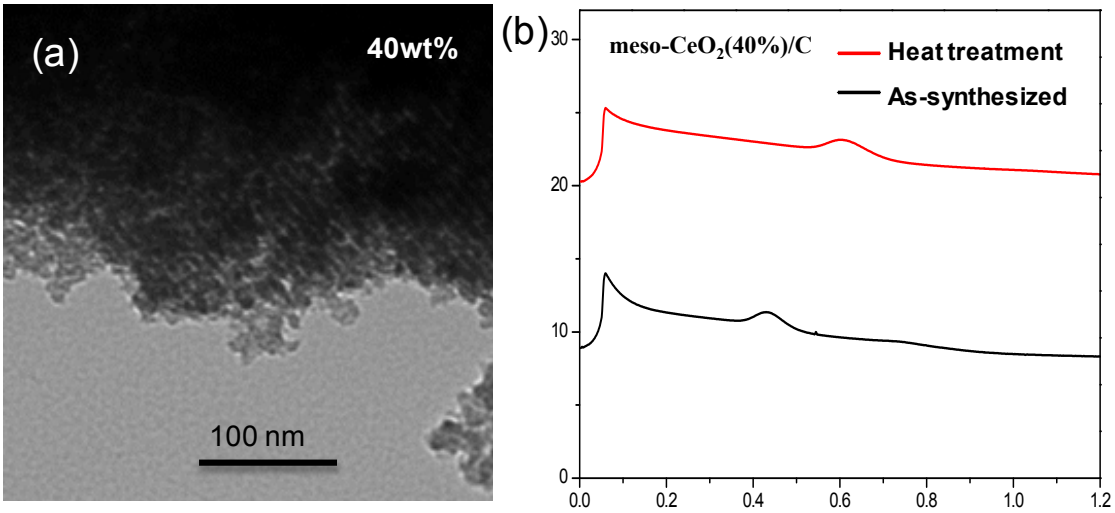


**Figure S1.** (a) TEM image and (b) SAXS trace of Meso-$CeO_2$ (40%)/C.

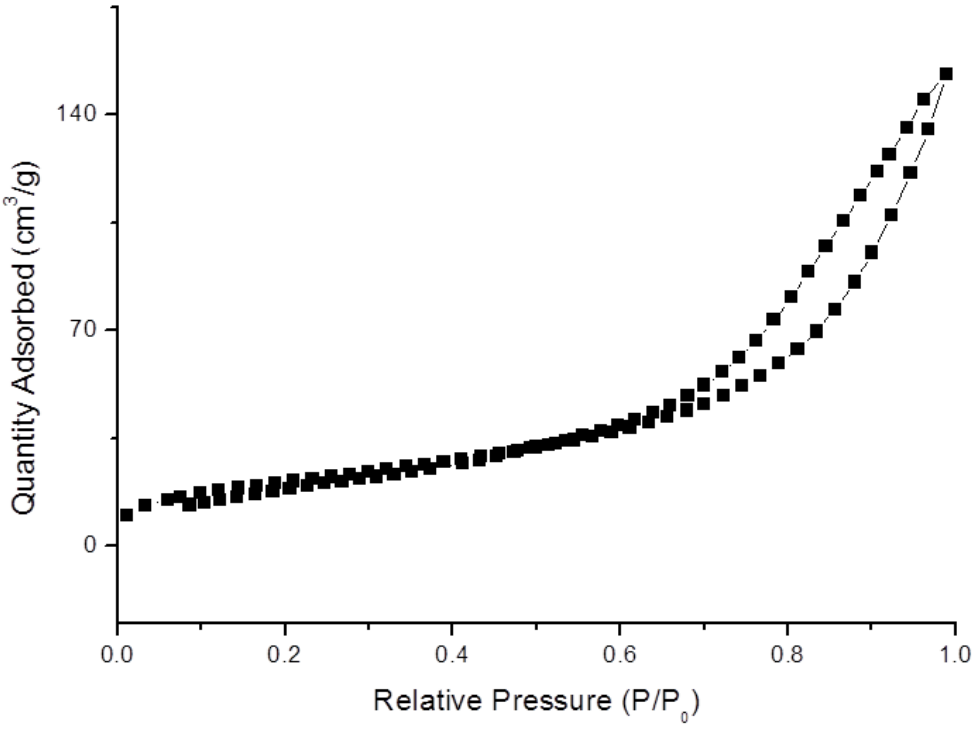


**Figure S2.** Nitrogen adsorption/desorption isotherms of the nanocomposite entrapping GOx in Meso-$CeO_2$ (60%)/C.

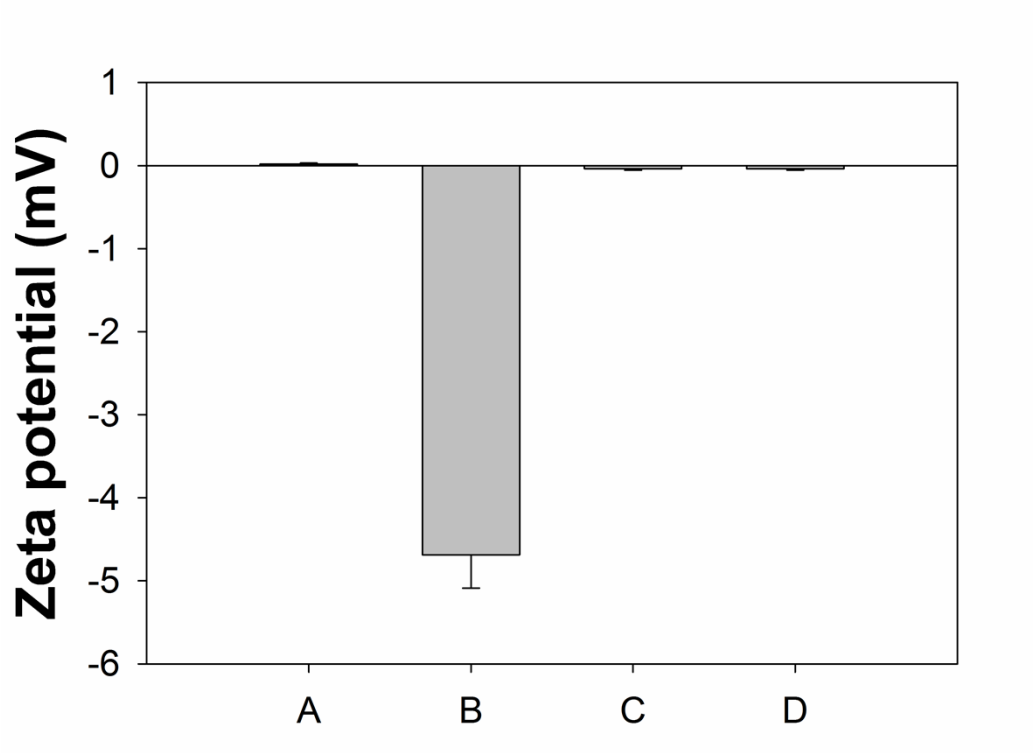


**Figure S3.** Zeta potential measurements at pH 7. A: Meso-$CeO_2$ (60%)/C, B: Meso-$CeO_2$ (60%)/C after the immobilization of GOx, C: Meso-$CeO_2$ (20%)/C, D: Meso-$CeO_2$ (20%)/C after the immobilization of GOx

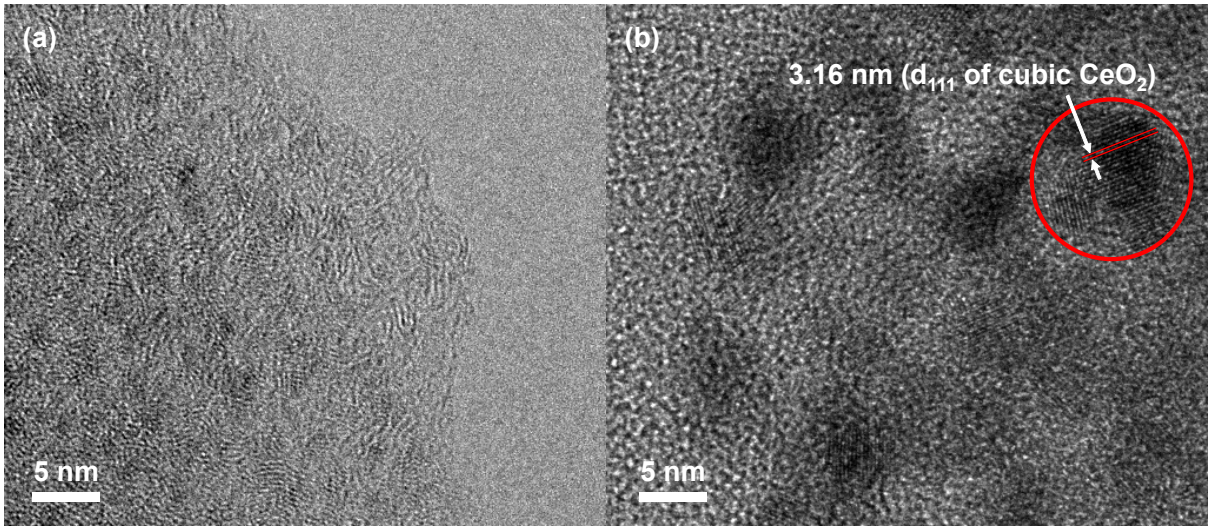


**Figure S4.** High resolution TEM images of (a) Meso-$CeO_2$ (20%)/C and (b) Meso-$CeO_2$ (60%)/C. $d_{111}$ spacing of cubic $CeO_2$ nanocrystals is shown in the image.

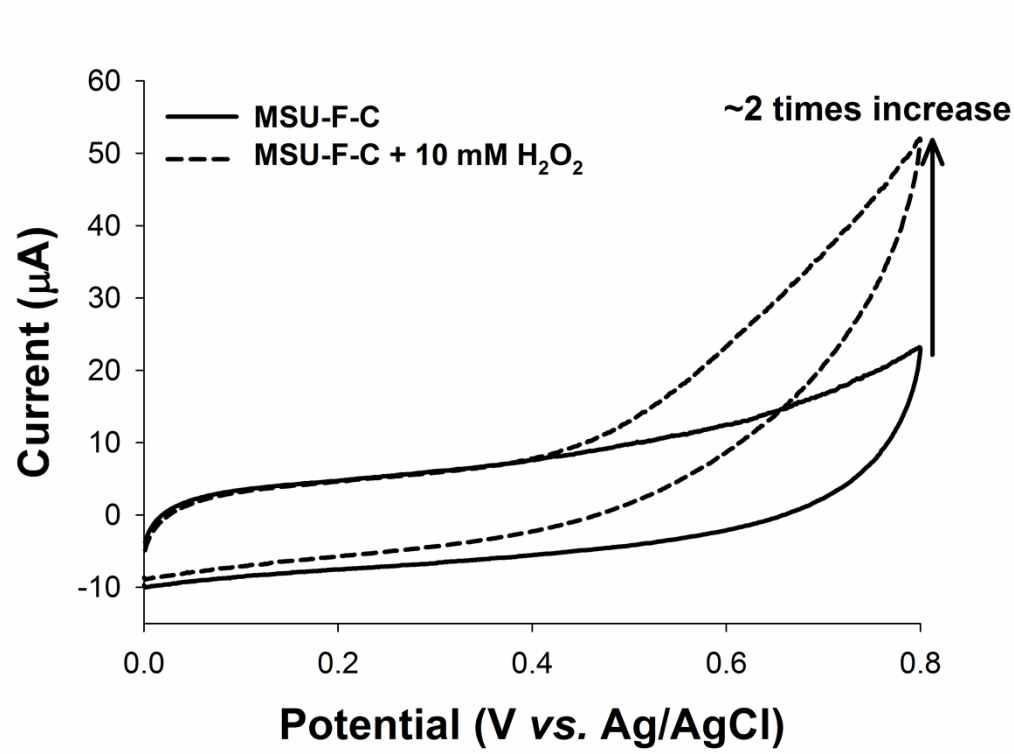


**Figure S5.** Cyclic voltammetry to determine the effect of $H_2O_2$ on the current signal. MSU-F-C without $CeO_2$ was employed in this experiment.

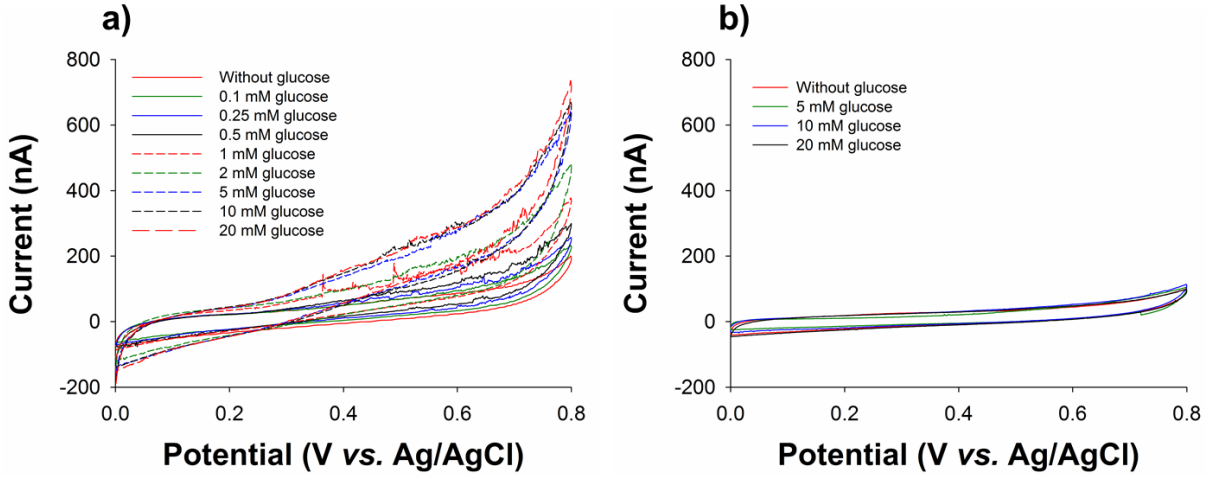


**Figure S6.** Cyclic voltammetry to determine the effect of glucose level on the current signal. a) nanocomposite after the immobilization of GOx in Meso-$CeO_2$ (60%)/C, b) nanocomposite after the immobilization of GOx in Meso-$CeO_2$ (20%)/C.

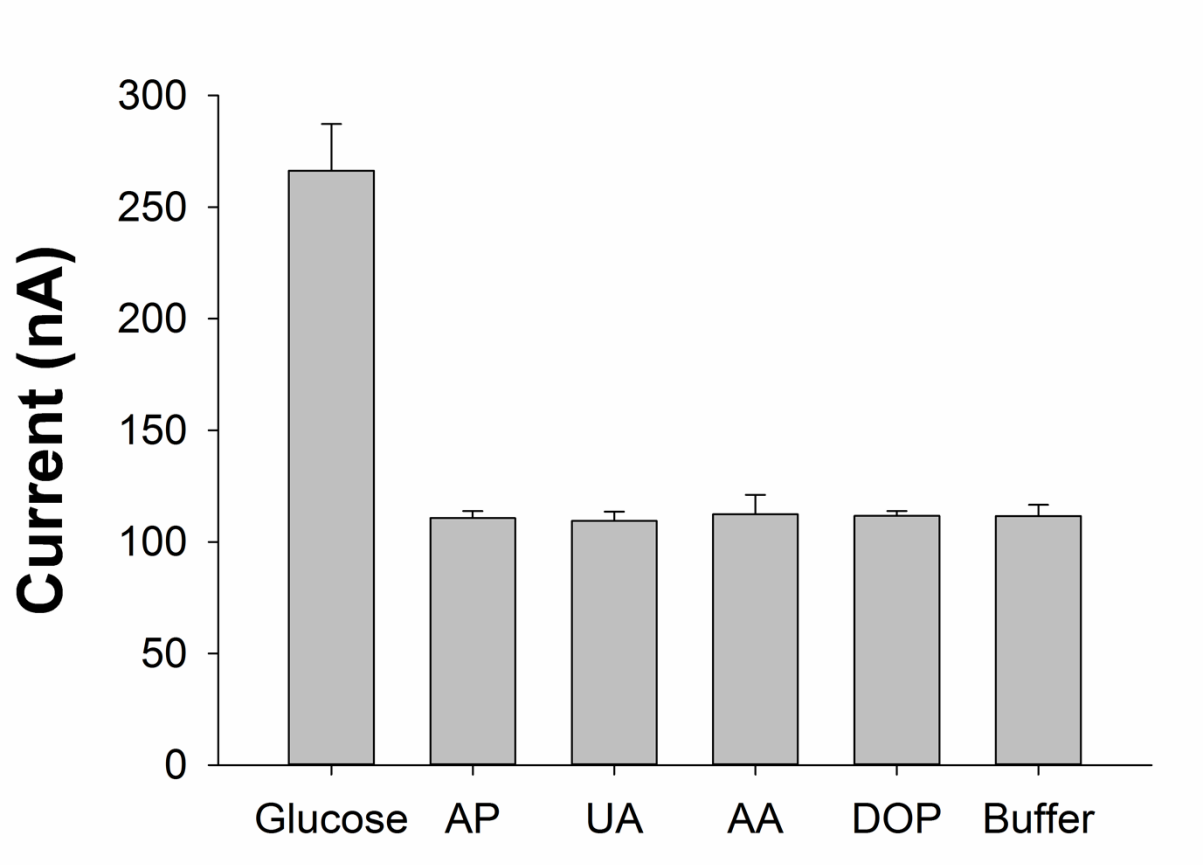


**Figure S7.** Current responses towards various potential interfering substances in serum. The concentrations of glucose, acetaminophen (AP), uric acid (UA), ascorbic acid (AA), and dopamine (DOP) were 1 mM, 100 μM, 20 μM, 50 μM, and 3 nM, respectively.

**Table S1.** Comparison of the performances of the various $CeO_2$-based electrochemical biosensors for $H_2O_2$ and glucose sensing with the present system.

| Biosensor design | LOD (μM) | Linear range (mM) | Sensitivity (μA/mM) | Shelf life | Detection condition | Ref |
|---|---|---|---|---|---|---|
| $H_2O_2$ detection | | | | | | |
| $CeO_2$ | 0.098 | 0.0022-0.32 | 240 | NR | Buffer | 17 |
| $CeO_2$/platinum/graphene | 0.5 | NR | 11.1 | NR | Buffer | 18 |
| $CeO_2$ | 1 | 0.001-0.05 | 0.48 | NR | Buffer | S1 |
| $CeO_2$ | 0.6 | NR | 21.13 | NR | Buffer | S2 |
| $CeO_2$/Au | 7 | 0.05-2.5 | 3.0 | NR | Buffer | S3 |
| Meso-$CeO_2$/C | ~10 | 0.1-5 | 0.198 | NR | Buffer | This study |
| Glucose detection | | | | | | |
| $CeO_2$/platinum | NR | 1.39-8.33 | 0.5 | 10 weeks | Buffer | 16 |
| $CeO_2$ | 34.1 | 0.2-12.3 | 1.65 | NR | Buffer | 17 |
| $CeO_2$/platinum/graphene | 1.3 | NR | 66.2 | NR | Buffer | 18 |
| $CeO_2$ | 12 | 2.78-22.2 | 0.05 | 12 weeks | Buffer | S4 |
| Meso-$CeO_2$/C | 100 | 0.25-5 | 0.05 | 2 months | Buffer & clinical serum | This study |

NR = not reported.

## References

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S2. S. K. Ujjain, A. Das, G. Srivastava, P. Ahuja, M. Roy, A. Arya, K. Bhargava, N. Sethy, S. K. Singh, R. K. Sharma and M. Das, *Biointerphases*, 2014, **9**, 031011.

S3. W. Zhang, G. Xie, S. Li, L. Lu and B. Liu, *Appl. Surf. Sci.*, 2012, **258**, 8222-8227.

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