Supporting Information

Silver-functionalized Bismuth oxide nanoparticles ($AgBi_2O_3$) for superior electrochemical detection of Glucose, NO_2^- and H_2O_2

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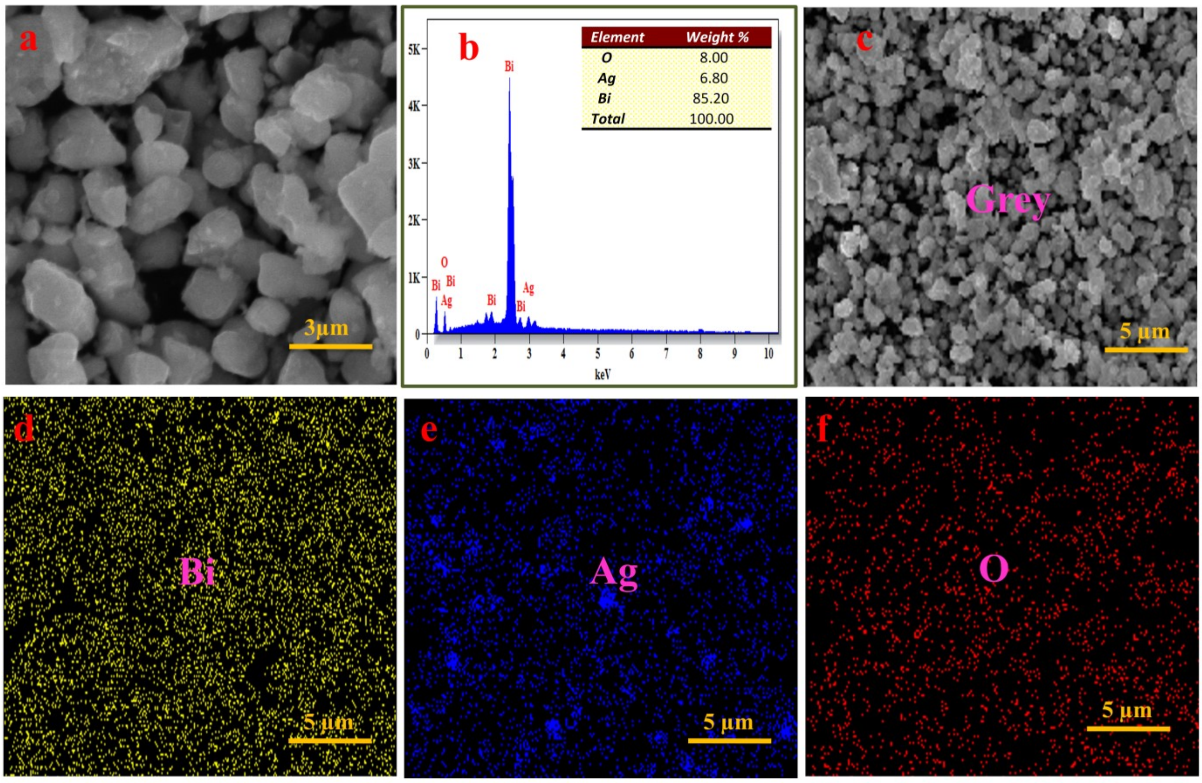

Fig. S1. a) HR-SEM image of SBO NPs, b) EDS spectrum of SBO NPs, c) Mapping analysis of gray spectrum, d) Mapping of Bi, e) Mapping of Ag, and f) Mapping of O.

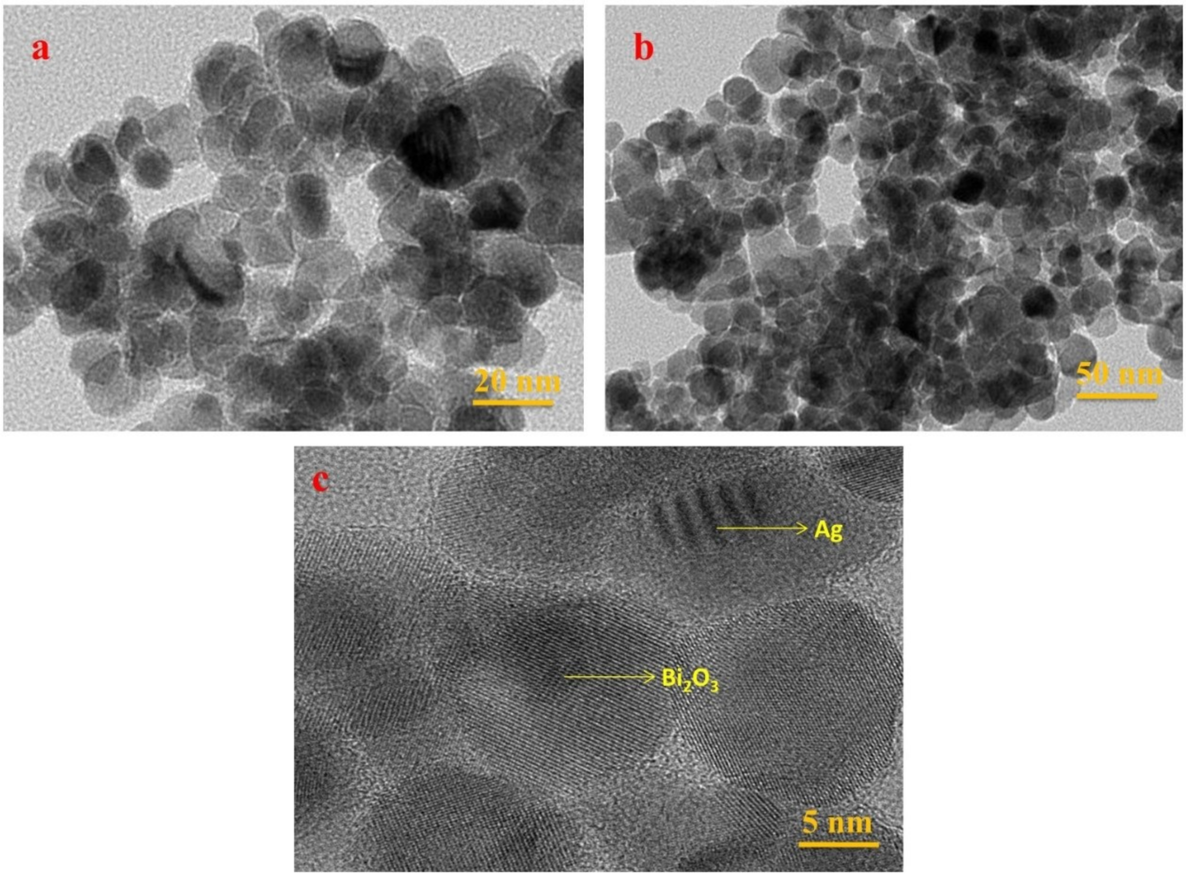

Fig. S2. HR-TEM image of SBO NPs a) 20nm, b) 50 nm, c) IFFT image.

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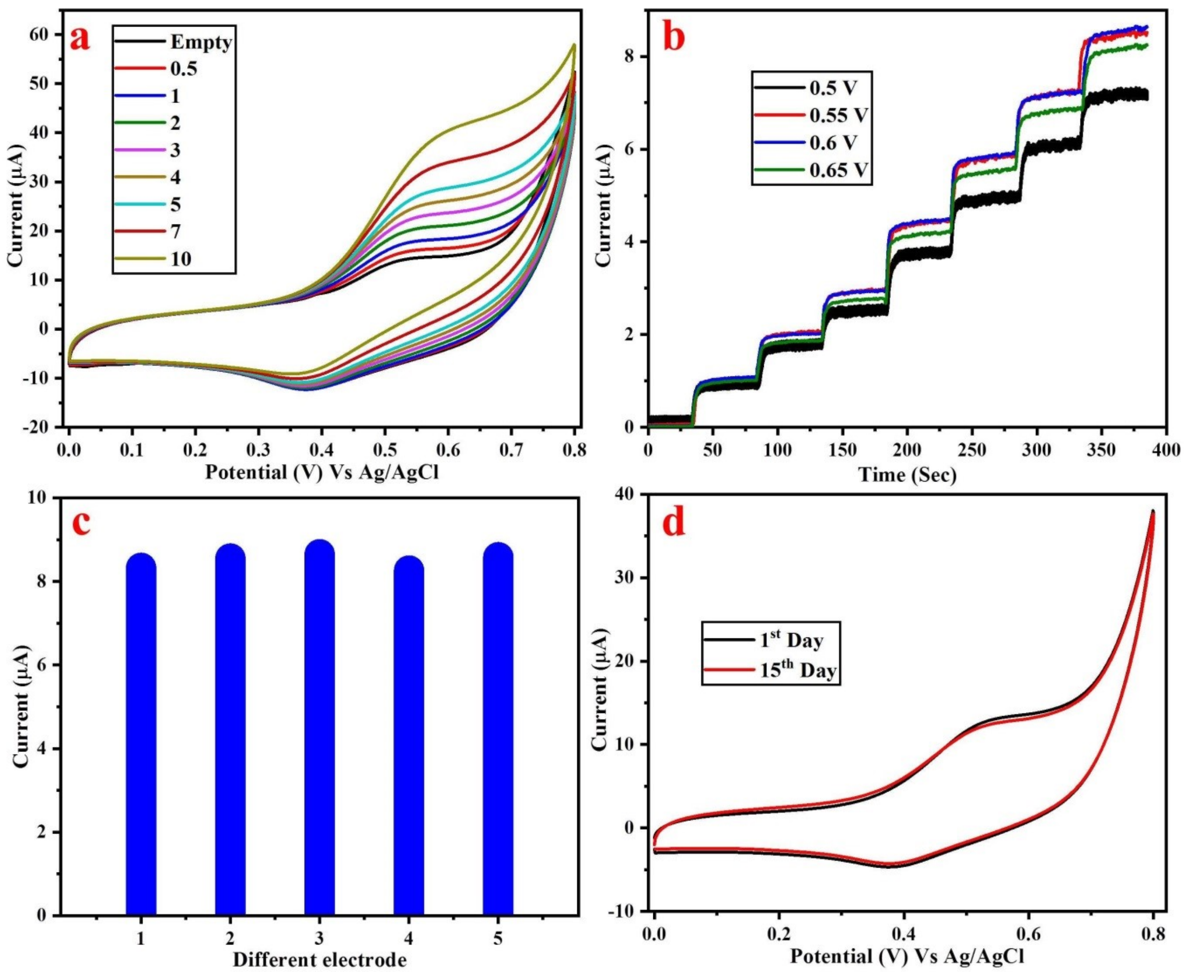
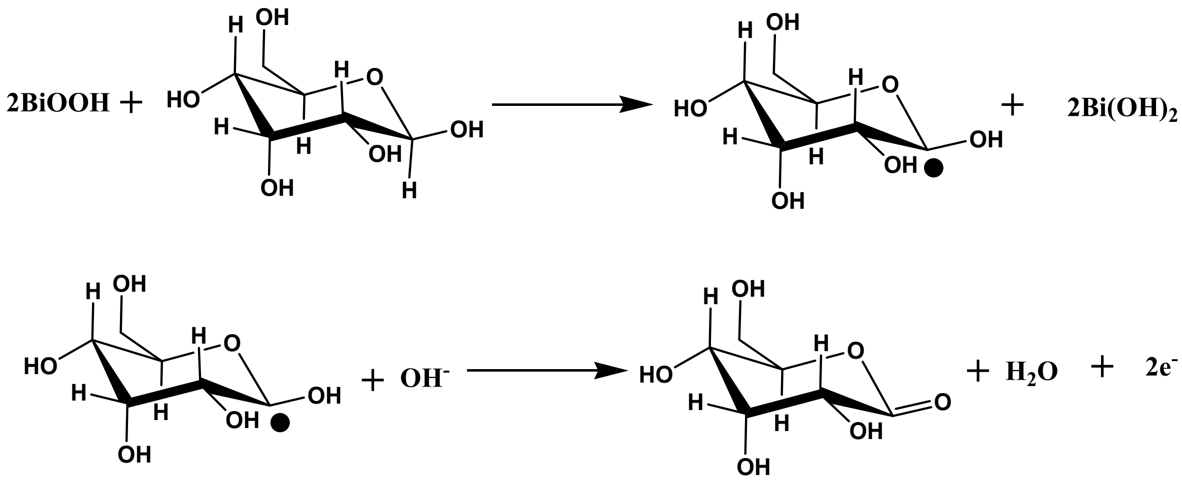


Fig. S3. a) CVs recorded at the SBO-GC electrode with different concentration of glucose. b) Amperometric i-t curve for different potential in addition of 0.5 and 1 mM of glucose in NaOH solution. c) Reproducibility study for SBO-GCE for five different electrodes. d) CV plot of stability study recorded before and after 15 days with 1 mM of glucose.



Scheme S1. Electrochemical mechanism for detection of glucose

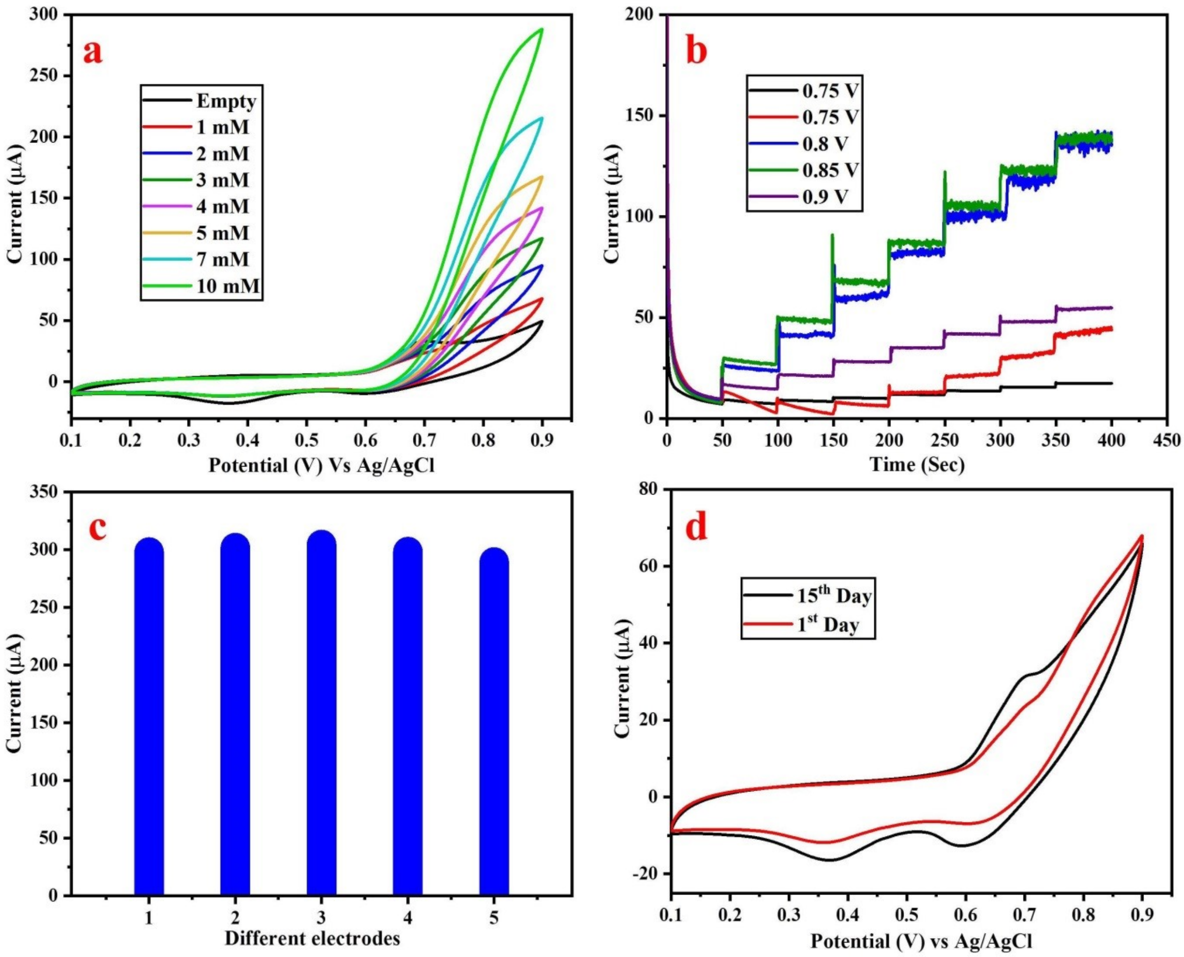


Fig. S4. a) CVs recorded at the SBO-GC electrode with different concentration of NO_2^-. b) Amperometric i-t curve for different potential in addition of 0.5 mM of NO_2^- in 0.1 M NaOH solution. c) Reproducibility study for SBO-GCE for five different electrodes. d) CV plot of stability study recorded before and after 15 days with 1 mM of NO_2^-.

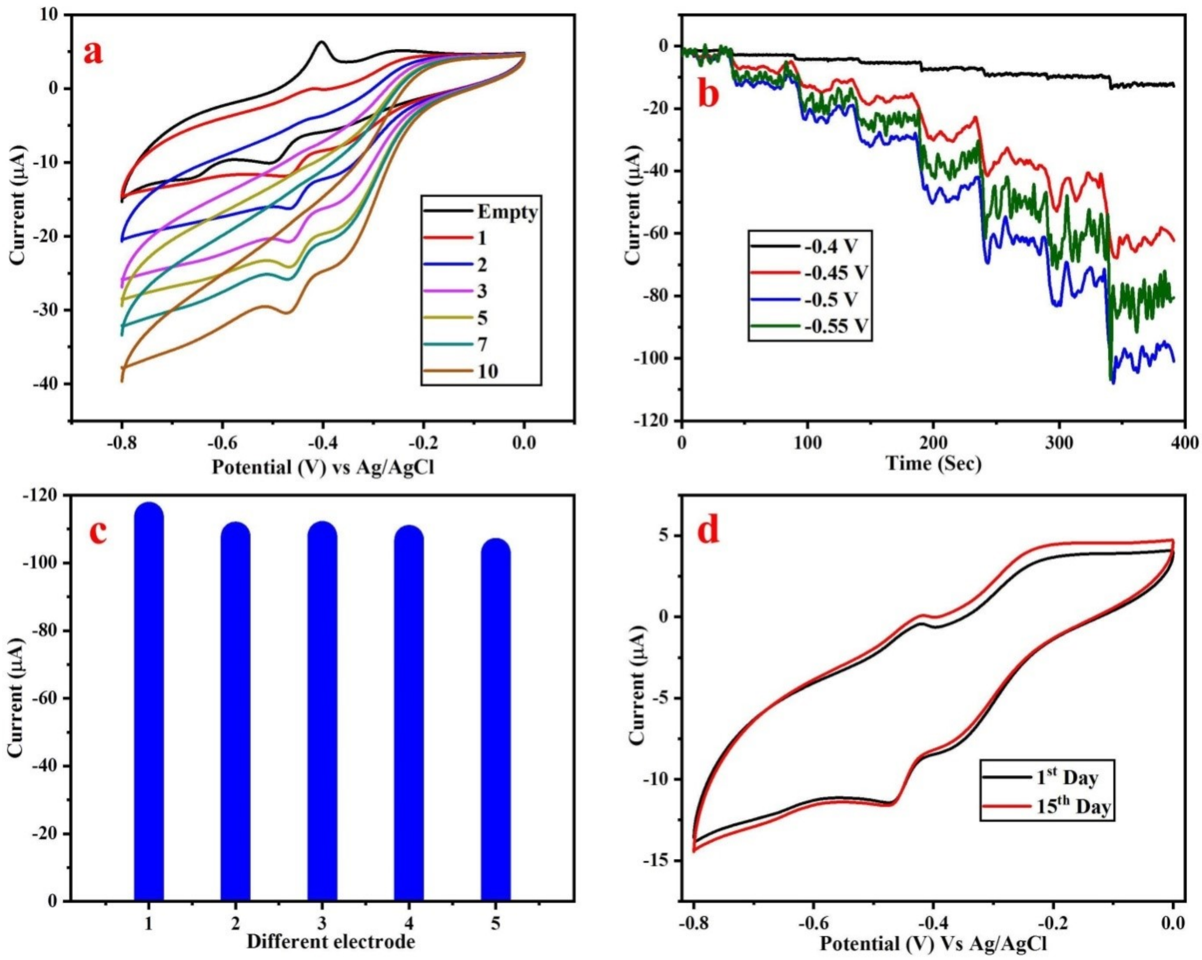


Fig. S5. a) CVs recorded at the SBO-GC electrode with different concentration of glucose. b) Amperometric i-t curve for different potential in addition of 0.5 and 1 mM of H_2O_2 in 0.1 M NaOH solution. c) Reproducibility study for SBO-GCE for five different electrodes. d) CV plot of stability study recorded before and after 15 days with 1 mM of H_2O_2.

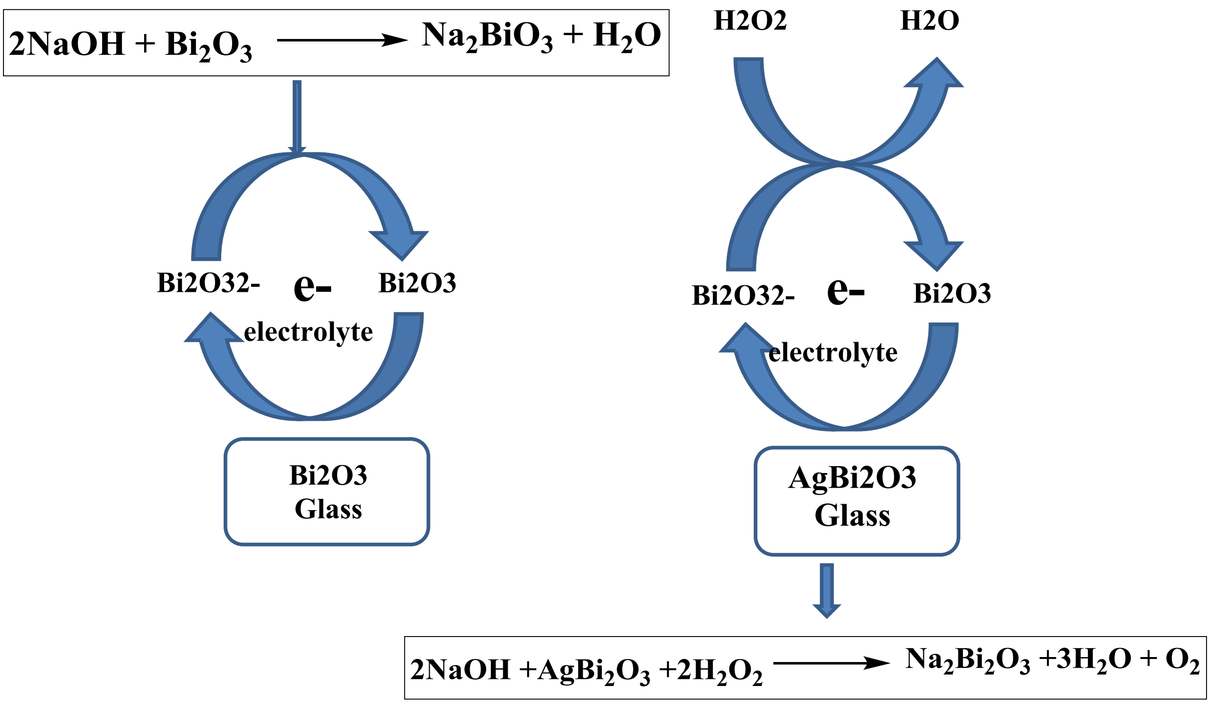


Fig. S6. The proposed mechanism for the reduction of H_2O_2 on the SBO-GC electrode

Effect of temperature

The amperometric response was recorded in optimum working environments (in 0.1 M NaOH), at various temperatures (20 to 40 °C), which are shown in **Fig. S7**. The steady state current increases from 20 to 30 °C, after 30 °C it was decreased in the amperometric response. This drop was an effect of the loss of activity initiated by the higher temperatures. Conversely, the amperometric response of the biosensor at 25 and 30 °C was very similar to each other (**Fig. S7**). Therefore, in order to keep the fabricated electroe more stable, 25 °C, which is very close to the growth temperature of the bacterium (28 °C), was employed in further studies.

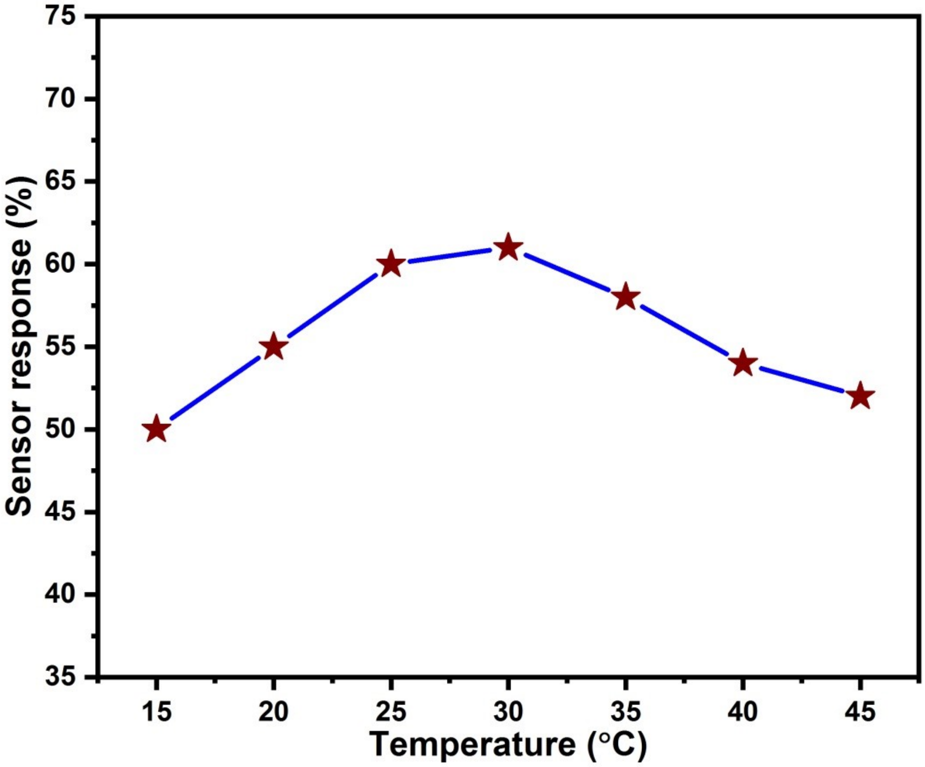


Fig. S7. The thermal effect on the fabricated $AgBi_2O_3$-GCE sensing response to addition of glucose in electrolyte solution

Table S1. Comparison of the Analytical Performance for Different Nanomaterial-Based on Electrochemical Sensing of Glucose

Sensor Materials	Detection potential (V)	Sensitivity (μA mM^{-1} cm^{-2})	LOD	Linear range	Refs.
Ag/CNT/Ch/ITO	-0.51	135.9	0.1 µM	0.5 – 50 µM	1
Ag-PANI/rGO	0.5	2.7664	0.79 µM	0.1 µM – 50 µM	2
PmAPNFs/AgNPs/GCE	0.34	17.45	0.062 µM	0.1–8.0	3
GOD/nano-BiOx	0.5	51	0.4 µM	1 µM – 1.5 mM	4
SPCE/GNR/Bi2O3	0.6	64.81	0.07 mM	0.28 - 1.70 mM	5
BiOCl-G NHS	0.5	1.878	0.22 mM	0.5 – 2 mM	6
FTO|nano$CuBi_2O_4$|CuO	0.55	330	0.7 µM	Upto 8 mM	7
HO-$BiONO_3$- GCE	0.3	8.2	0.12 µM	5 µM – 2.1 mM	8
SBO-GCE	0.55	2.153	0.87 µM	1 µM – 5.848 mM	Present work

Table S2. Comparison of the Analytical Performance for Different Nanomaterial-Based on Electrochemical Sensing of NO_2^-

Sensor Materials	Detection potential (V)	Sensitivity ($\mu A\ mM^{-1}\ cm^{-2}$)	LOD	Linear range	Refs.
Ag-GCE	1.0	1642.27	0.046	1 μM – 6 mM	9
Ag-SO_3-NU-902	1.1	-	9.1	Upto 2 mM	10
AgNPs/MWCNTs/GCE	0.85	0.19	0.095	1 μM - 100 μM	11
rGO/AgNPs/poly(PyY)	0.86	13.5	0.012	1 μM - 1000 μM	12
Ag–P(MMA-co-AMPS)-GCE	0.9	104.6	0.2	1 μM - 100 mM	13
Bi_2Se_3@MWNTs-COOH/CE	0.8	223	0.002	0.01 μM - 7 mM	14
SBO-GCE	0.85	22	1.8	1 μM – 5.848 mM	Present work

Table S3. Comparison of the Analytical Performance for Different Nanomaterial-Based on Electrochemical Sensing of H_2O_2

Sensor Materials	Detection potential (V)	Sensitivity ($\mu A\ mM^{-1}\ cm^{-2}$)	LOD	Linear range	Refs.
CµF/Ag NPs-Naf	-0.35	21.93	0.485 µM	0.10 – 80 mM	15
AgNPs/Ox-pTTBA/MWCNT	-0.6	-	0.24 µM	10 – 260 µM	16
PpyNFs-AgNPs-rGO/GCE	-0.75	-	1.099 µM	0.1 – 5 mM	17
NF/HRP/Bi_2O_3–MWCNT/GCE	-0.3	26.54	-	8.34 – 28.88	18
BiNDs/GaN	-0.7	60	5 µM	0.01 – 1 mM	19
$CuBi_2O_4$	-0.6	280	0.38 mM	-	20
CPE/$BiFeO_3$	-0.8	0.142	0.080 µM	0.0002-0.05	21
SBO-GCE	-0.5	1.72	1.15 µM	2 µM – 6.847 mM	Present work

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