Supplementary Material

# Supplementary Figures



**Figure S1.** FTIR curves of bare and COOH-GR-COOH-MWNT-AuNPs.



**Figure S2.** CV graph (A) and EIS graph (B) of bare SPE (a) and COOH-GR-COOH-MWNT-AuNPs/SPE (b). CV graph (C) of different scan rates of COOH-GR-COOH-MWNT-AuNPs/SPE in 5 mM [Fe(CN)6]3−/4− solution (containing 0.1 M KCL).

 

**Figure S3.** i-t curves of COOH-GR-COOH-MWNT-AuNPs/SPE sensor for detection of different concentrations of arabinose, (B) The calibration curves of arabinose in the range of 2 mM to 50 mM.

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**Figure S4.** i-t curves of COOH-GR-COOH-MWNT-AuNPs/SPE sensor for detection of different concentrations of mannose, (B) The calibration curves of mannose in the range of 5 mM to 60 mM. ****  

**Figure S5.** i-t curves of COOH-GR-COOH-MWNT-AuNPs/SPE sensor for detection of different concentrations of xylose, (B) The calibration curves of xylose in the range of 2 mM to 40 mM.

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**Figure S6.** i-t curves of COOH-GR-COOH-MWNT-AuNPs/SPE sensor for detection of different concentrations of galactose, (B) The calibration curves of galactose in the range of 5 mM to 40 mM.

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**Figure S7.** (A) i-t curves of the same electrode for 5 times consecutive experiments in 20 mM glucose, (B) i-t curves of 5 electrodes in 20 mM glucose.

# Supplementary Tables

**Table S1 Comparison of analytical performance of different enzyme-free fructose sensors.**

|  |  |  |  |
| --- | --- | --- | --- |
| Electrode | Linear range  (mM) | Detection limit  (μM) | Ref. |
| ZnO/CdO/SnO2/GCE | 1×10-7-0.01 | 9.589×107 | (Alam et al., 2020) |
| Co3O4/FTO | 0.021-15 | 1.7 | (Gota et al., 2017) |
| 4MPB/PtNPs/MWCNT/Au | 2.5-10 | - | (Silva-Carrillo et al., 2017) |
| CuNP/Gr/silica capillary | 0.001-0.02 | 0.51 | (Chen et al., 2012) |
| Co/Au | 0.001-0.01 | 0.005 | (Lang et al., 2013) |
| CuO/Co3O4/GCE | 0.01-3 | 3 | (Wang et al., 2011) |
| LaMnO3/GCE | 0.4-4 | 63 | (Xu et al., 2014) |
| COOH-GR-COOH-MWNT-AuNPs/SPE | 2-20 | 1630 | This work |

**Table S2 Comparison of analytical performance of different enzyme-free sugar sensors.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sugar | Electrode | Linear range  (mM) | Detection limit  (μM) | Ref. |
| Arabinose | Cu nanospheres/SPCE | 1-10 | 0.57 | (Pérez-Fernández et al., 2017) |
| Mannose | FcBA/3APBA/4MBA/AuNPs/ITO | 0.5-30 | 43 | (Chen et al., 2021) |
| Xylose | GCE/RGO-MIP | 1×10-11-1×10-8 | 8×10-11 | (Pompeu Prado Moreira et al., 2020) |
| Galactose | NPG | 0.01-1.8 | 5 | (Mie et al., 2020) |

**Table S3 Recovery rate of fructose in apple juice (n = 3).**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fructoseinitial  （mM） | Added  （mM） | Found  （mM） | RSD  （%） | Recovery  （%） |
| 17.491 (sensor) | 5 | 22.555 | 5.36% | 101.28% |
| 15.250 (HPLC) | 10 | 27.708 | 5.91% | 102.17% |
|  | 20 | 38.575 | 4.39% | 105.42% |

**Table S4 Recovery rate of Arabinose in apple juice (n = 3).**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Arabinoseinitial | Added  （mM） | Found  （mM） | RSD  （%） | Recovery  （%） |
| 4.698 mM(sensor) | 10 | 15.226 | 4.349% | 105.28% |
|  | 20 | 25.597 | 3.951% | 104.50% |
|  | 30 | 33.704 | 6.868% | 96.69% |

**Table S5 Recovery rate of Mannose in apple juice (n = 3).**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mannoseinitial | Added  （mM） | Found  （mM） | RSD  （%） | Recovery  （%） |
| 7.568 mM(sensor) | 10 | 17.455 | 5.618% | 98.87% |
|  | 20 | 27.113 | 4.357% | 97.73% |
|  | 30 | 39.103 | 4.672% | 105.12% |

**Table S6 Recovery rate of Xylose in apple juice (n = 3).**

|  |  |  |  |
| --- | --- | --- | --- |
| Added  （mM） | Found  （mM） | RSD  （%） | Recovery  （%） |
| 10 | 10.095 | 5.296% | 100.95% |
| 20 | 19.983 | 4.381% | 99.91% |
| 30 | 31.435 | 4.747% | 104.78% |

**Table S7 Recovery rate of Galactose in apple juice (n = 3).**

|  |  |  |  |
| --- | --- | --- | --- |
| Added  （mM） | Found  （mM） | RSD  （%） | Recovery  （%） |
| 10 | 11.842 | 3.418% | 98.42% |
| 20 | 22.977 | 3.753% | 104.89% |
| 30 | 31.979 | 4.992% | 103.26% |

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