# Supporting Information

**A label-free fluorescent sensor based on silicon quantum dots-$MnO_2$ nanosheets for the detection of α-glucosidase and its inhibitor**

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## Reagents

α-glucosidase was purchased from Sigma Reagents Company. Tetramethylammonium (TMA) was purchase from Beijing Chemical Works. L-ascorbic acid-2-O-α-D-glucopyranosy (AAG), (3-aminopropyl) trimethoxysilane (APTES) and acarbose were purchased from Shanghai Aladdin Co. Ltd. Hydrogen peroxide ($H_2O_2$), ascorbic acid (AA), glucose, aspartic acid, histidine, and glutamate were purchased from Beijing Dingguo Biotechnology Co. Ltd. $MnCl_2 \cdot 4H_2O$, NaCl, $CaCl_2$, $ZnCl_2$ were purchased from Tianjin Guangfu Institute of Fine Chemicals. Tyrosinase (TYR), glucose oxidase ($GO_X$), pepsin, trypsin and protein kinase (PKA) were purchased from Sino-American Biotechnology Co. Ltd. Trisodium citrate was purchased from Sinopharm Chemical Reagent Co. Ltd. All chemicals used were of analytical reagent grade without further purification. Phosphate buffered saline (PBS) was prepared by mixing different ratios of $Na_2HPO_4$ and $NaH_2PO_4$ solution. The resistivity of distilled water used in all experiments was higher than 18 MΩ $cm^{-1}$.

## Instruments

Scanning electron microscope (SEM) experiment was performed on a JF6700 scanning electron Microscope (JEOL Ltd, Japan). Fluorescence spectra were collected with a Shimadzu RF-5301 PC spectrofluorophotometer (Shimadzu Co.Ltd, Kyoto, Japan). UV–vis absorption spectra were collected on Varian GBC Cintra 10e UV–visible Spectrophotometer (Shimadzu Co.Ltd, Kyoto, Japan). FT-IR spectra was recorded by using a Bruker IFS66V FT-IR Spectrometer (Bruker Corporation, Germany). All pH measurements throughout the study were performed with a PHS-3C pH meter (INESA Scientific Instrument Co. Ltd, Shanghai, China).

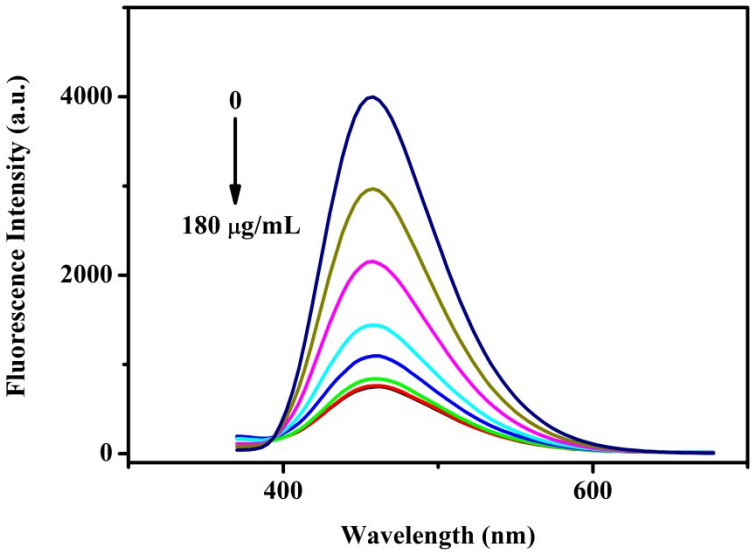


**Fig. S1.** Fluorescence emission spectra of SiQDs with different concentrations of $MnO_2$ nanosheets (0, 20, 40, 80, 120, 140, 160 and 180 μg $mL^{-1}$).

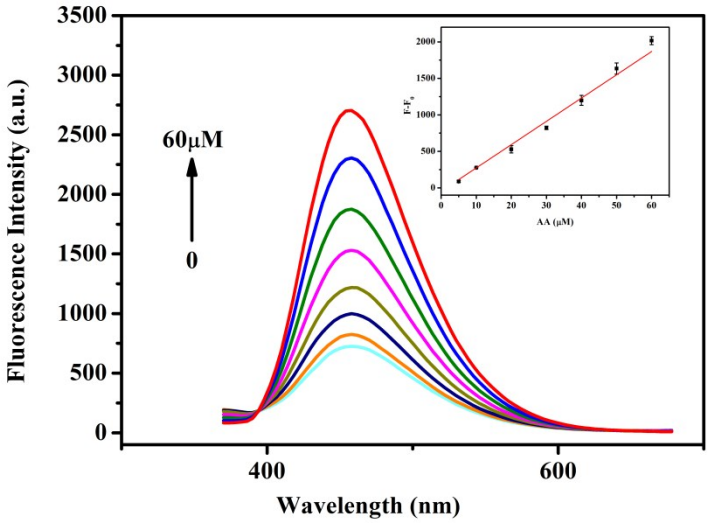


**Fig. S2.** Fluorescence emission spectra of SiQDs/$MnO_2$ nanosheets with different concentrations of AA (0, 5, 10, 20, 30, 40, 50 and 60 μM).

**Table S1.** Detection of α-glucosidase in human serum samples

| Sample | Added (U/mL) | Founded (U/mL) | | Recovery (%) | RSD (n=3,%) |
|---|---|---|---|---|---|
| | | Colorimetry | Our method | | |
| serum | 0 | 0.060 | 0.063 | - | - |
| | 0.050 | 0.13 | 0.11 | 94.00 | 0.75 |
| | 0.10 | 0.16 | 0.17 | 107.0 | 3.24 |
| | 0.45 | 0.47 | 0.50 | 97.11 | 2.50 |

**Table S2.** Comparison of our method with the previous methods for the detection of α-glucosidase

| Methods | Materials | Linear range (U/mL) | LOD (U/mL) | Reference |
|---|---|---|---|---|
| Colorimetric assay | Gold nanoparticles | 0.05 − 1.1 | 0.004 | [1] |
| Fluorescence assay | N-doped CDs | 0.2 − 10 | 0.01 | [2] |
| Fluorescence assay | Conjugated polymer and PNPG | 0.1 − 0.5 | 0.01 | [3] |
| Electrochemical assay | Gold nanoparticle-modified gold electrode | 0.1 – 1.1 | 0.04 | [4] |
| Electrochemical assay | AgNPs/DA and MNPs/ pAPG with PBA/GE | 0 − 1.1 | 0.04 | [5] |
| Fluorescence assay | SiQDs/$MnO_2$ nanosheets | 0.02 − 2.5 | 0.007 | This work |

**Table S3.** Comparison of our method with the previous methods for the detection of acarbose

| Methods | Materials | Linear range (μM) | IC50 (μM) | Reference |
|---|---|---|---|---|
| Fluorescence assay | N-doped CDs | 0.1 − 1000 | 58.68 | [2] |
| Colorimetric assay | Gold nanoparticles | − | 5.87 | [6] |
| Fluorescence assay | β-CD-CQDs nanoprobe | 50 − 500 | 319 | [7] |
| Fluorescence assay | N,B-CDs | 0.03−5000 | 58 | [8] |
| Fluorescence assay | SiQDs/$MnO_2$ nanosheets | 1−1000 | 33.88 | This work |

## References


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