Supporting Information

A ratiometric fluorescent biosensor for sensitive determination of α-glucosidase activity and acarbose based on N-doped carbon dots

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Reagents

Acarbose Hydrate, Adenosine (A), Branched polyethyleneimine (PEI, molecular weight = 10000) and Protamine (pro) were supplied by Shanghai Aladdin biochemical Co. Ltd. α-Glucosidase was purchased from Sigma Reagents Company. α-Arbutin was purchased from Shanghai Macklin Biochemical Technology Co., Ltd. Hydroquinone, reduced L-glutathione (GSH), trypsin (Try), hyaluronidase (HAase), bovine serum albumin (BSA), hemoglobin (Hb), urease (Urea), lysozyme (Lys) and Human serum albumin (HSA) were ordered from Sangon Biotech (Shanghai) Co. Ltd. NaH_2PO_4, Na_2HPO_4 and pepsin (pep) were obtained from Sino-pharm Co. (Shanghai, China). Phosphate buffer saline (PBS, 100 mmol L^{-1}) were prepared with different volume ratio of 400 mmol L^{-1} NaH_2PO_4 and 400 mmol L^{-1} Na_2HPO_4. Ultrapure water with good resistivity ($\rho \geq 18$ MΩ cm^{-1}) throughout this experiment was used. The pH values were recorded by PHS-3C (Hangzhou, China). All chemicals are obtained from formal chemical suppliers and can be used directly without any further purification.

Instruments

The ultraviolet-visible (UV–vis) absorption spectra, Photoluminescence (PL) spectra and Fourier transform infrared (FT-IR) spectra were obtained by a Varian GBC Cintra 10e UV–vis Spectrophotometer (Shimadzu Co., Ltd. Japan), RF-5301 fluorescence spectrophotometer and Thermo Nicolet 360 FTIR spectrometer, respectively. Transmission electron microscope (TEM) was carried on JEM-2100F. Fluorescence lifetime data was obtained on Edinburgh FLS920.

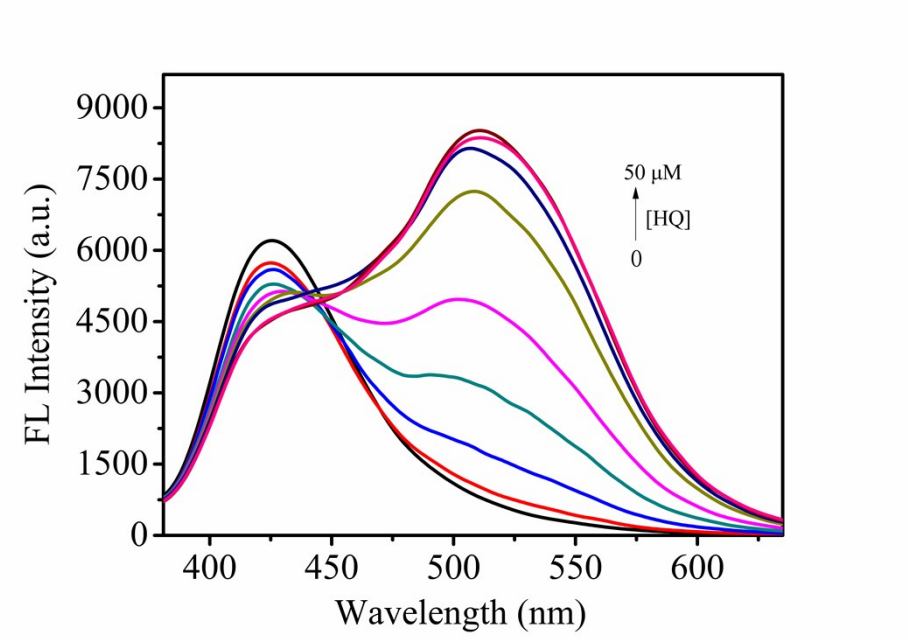

Fig. S1 Fluorescence emission spectra of the N-CDs/$P_{HQ\text{-}PEI}$ system with various concentrations of hydroquinone from 0 to 50 μM (0, 0.5, 2, 5, 10, 20, 30, 40, 50 μM).

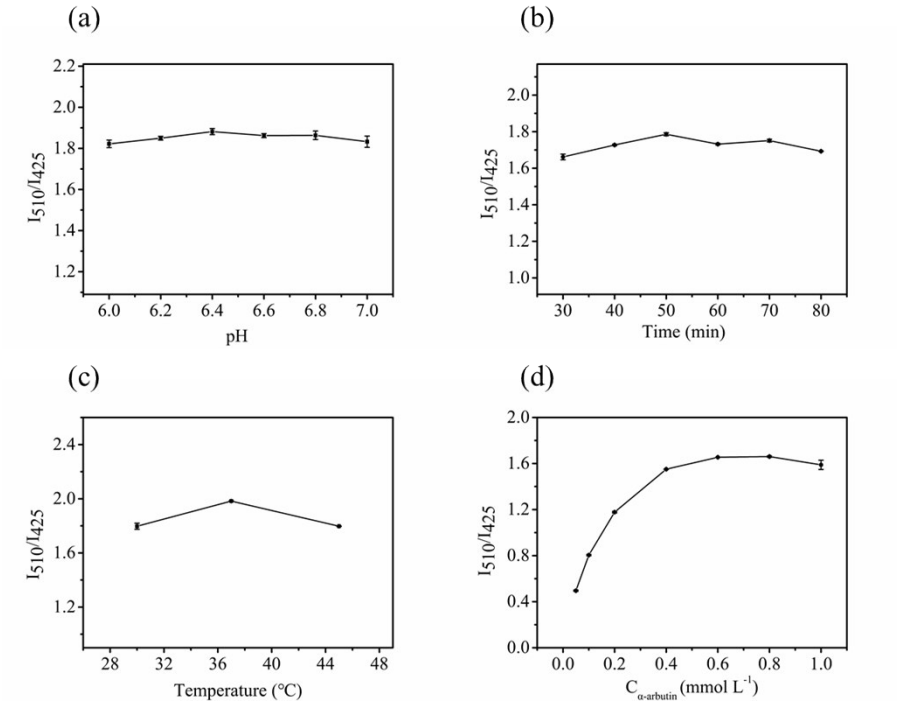

Fig. S2 (a) Effect of enzyme pH on I_{510}/I_{425}. (b) Effect of enzyme reaction time between α-glucosidase and α-arbutin. (c) Effect of enzyme temperature on I_{510}/I_{425}. (d) Effect of the α-arbutin concentration on I_{510}/I_{425}.

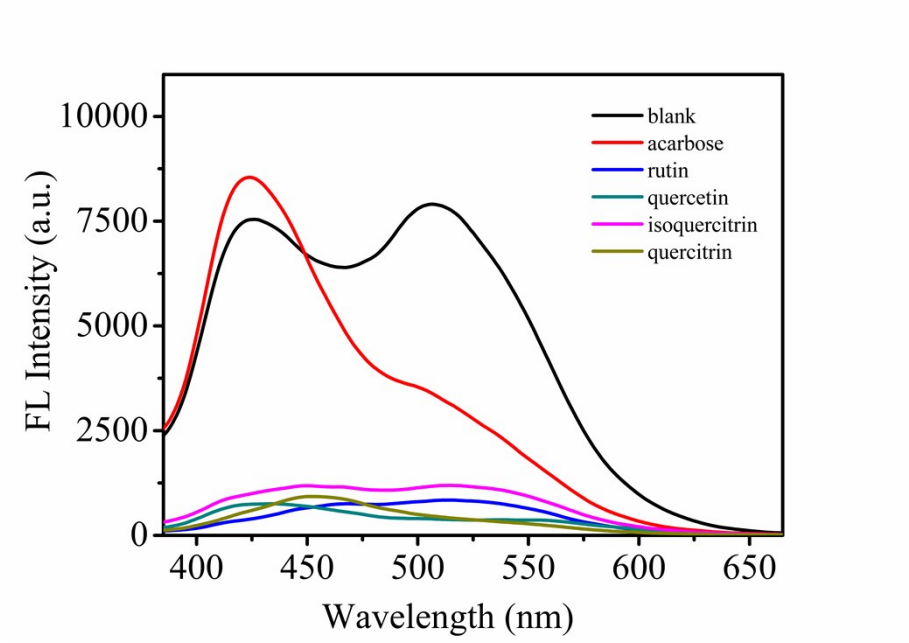

Fig. S3 (a) Fluorescent intensity ratio (I_{510}/I_{425}) response to different inhibitors: acarbose, rutin, quercetin, quercitrin and isoquercitrin (160 μmol mL^{-1}).

Table S1 Comparison of our method with other methods for the determination of α-glucosidase

Detection methods	Materials	Linear range (U mL^{-1})	LOD (U mL^{-1})	References
Ratiometric fluorescence	Dual-color carbon dots	0.13-6.70	0.036	[1]
Ratiometric fluorescence	Ag nanoclusters/MnO_2 nanosheet	0.2-8.0	0.03	[2]
Electrochemistry	Pyrene boric acid	0-1.1	0.04	[3]
Electrochemistry	Gold nanoparticle-modified gold electrode	0.1-1.1	0.04	[4]
Colorimetry	Gold nanorods	0.0025-0.045	0.0005	[5]
Fluorescence	Cationic Conjugated Polymers	0.1-0.5	0.01	[6]
Ratiometric fluorescence	N-CDs/P_{HQ-PEI}	0.0002-0.0016	8.2×10^{-5}	This work

References:

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