Electronic Supporting Information (ESI)

Biomass-based quantum dots co-doped with sulfur and nitrogen for highly sensitive detection of thrombin and inhibitor

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1. The measurement of quantum yield

The fluorescence quantum yield (QY) of the S,N-BQDs was obtained by following function:

$$\Phi = \Phi_{ref} \times (I_{sam}/I_{ref}) \times (A_{ref}/A_{sam}) \times (\eta^2_{sam}/\eta^2_{ref})$$

Quinine sulfate (0.1 M H_2SO_4 as a solvent) was chosen as a standard. Where Φ is the QY, I is the measured integrated emission intensity, A and ŋ are the optical density and refractive index, respectively. The subscript "ref" refers to standard with known Φ, and "sam" refers to the samples.

2. Supplementary Figures

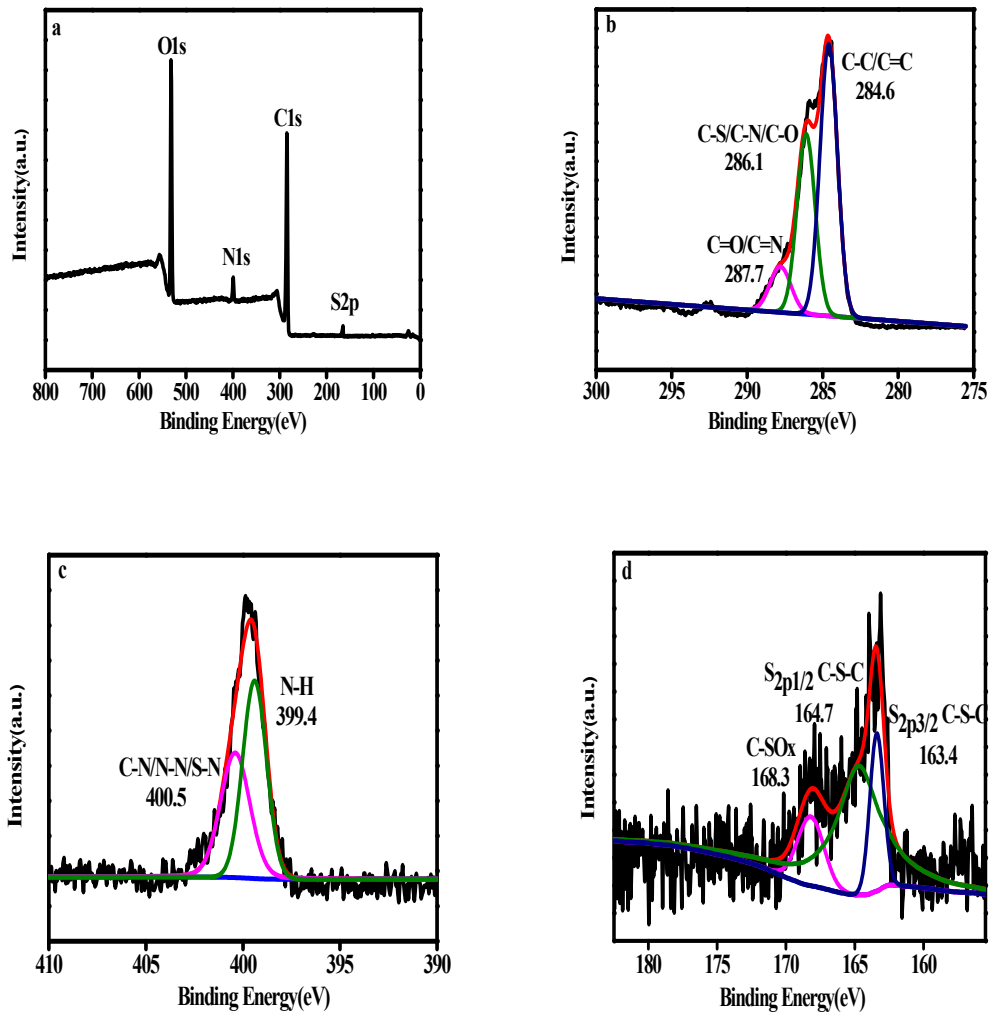

Fig. S1. XPS spectrum of S, N-BQDs (a) and high-resolution spectra of C1s, N1s and S2p.

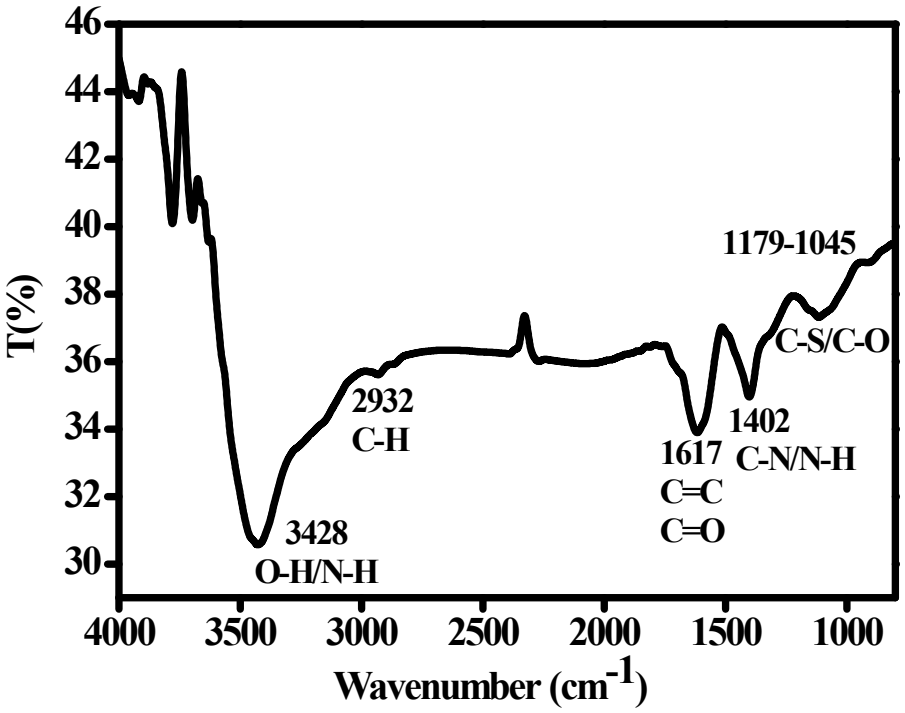

Fig. S2. FTIR spectrum of S, N-BQDs.

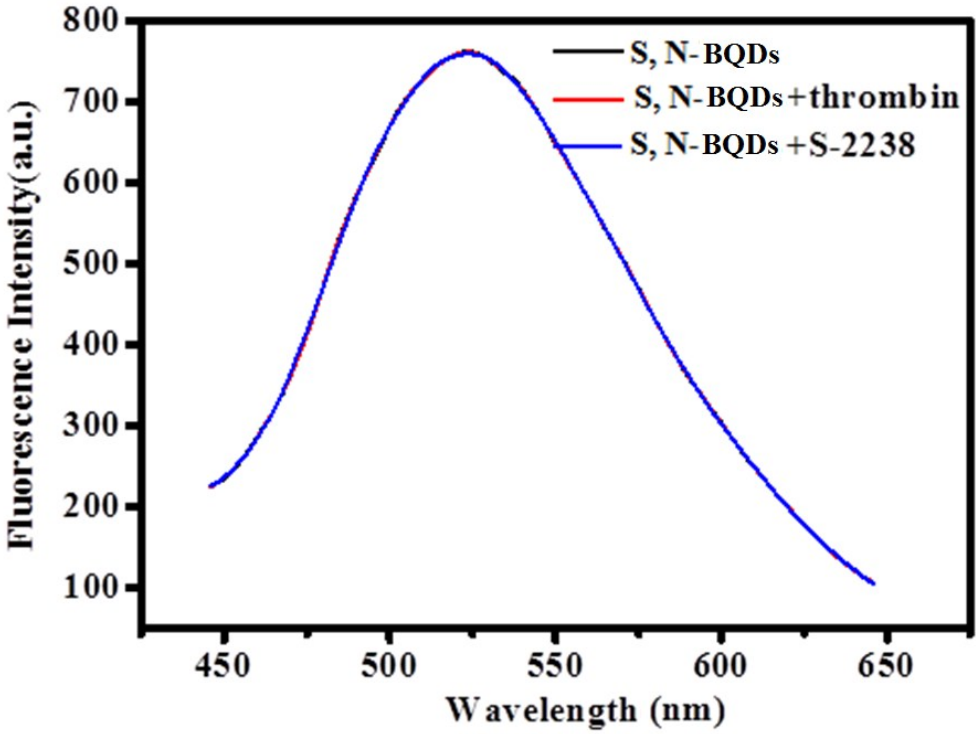

Fig. S3. The effect of thrombin or S-2238 on the fluorescence spectrum of S, N-BQDs.

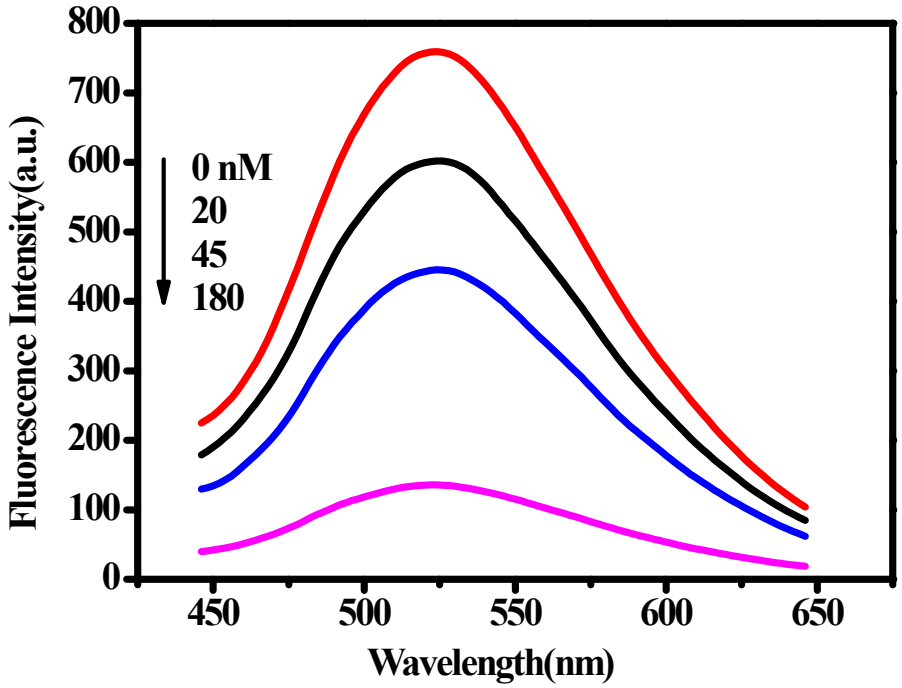

Fig. S4. The fluorescence spectra of the S, N-BQDs upon addition of various concentrations of thrombin from 0 to 180 nM with 2 mM S-2238.

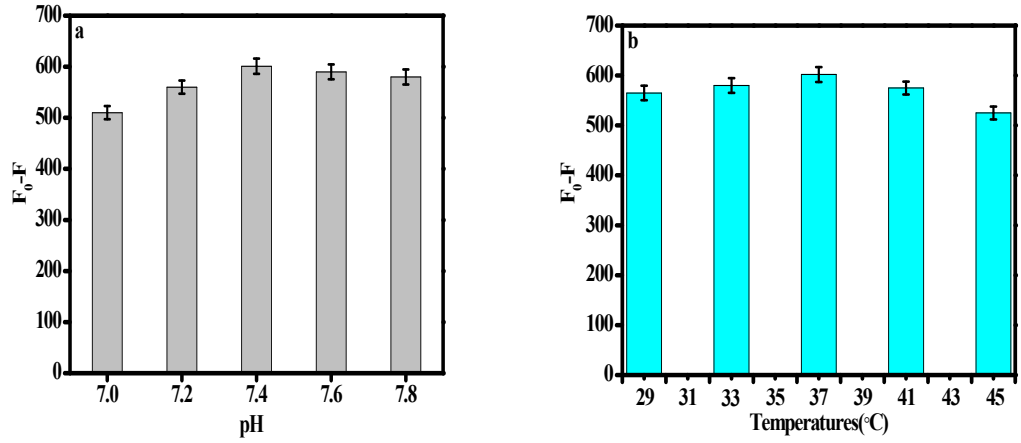

Fig. S5. The effects of Tris-HCl buffer pH (a) and incubating temperatures (b) on IFE based fluorescence assay.

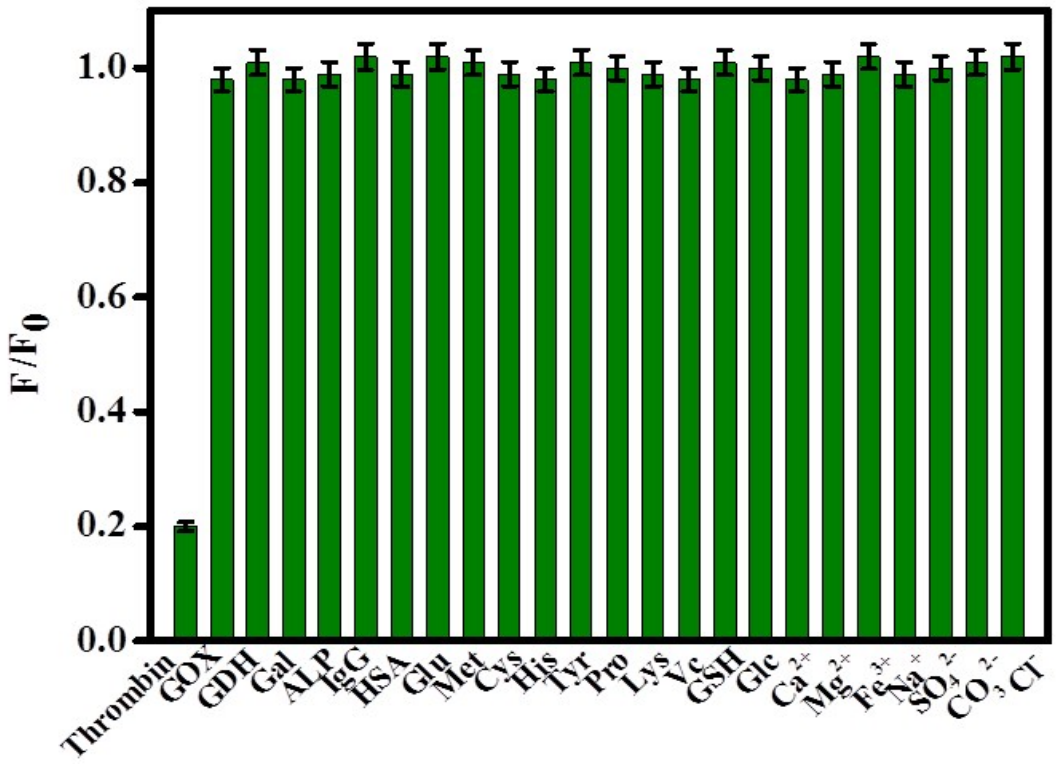

Fig. S6. The selectivity of thrombin assays in the presence of possible coexistence substances. The levels of GOX, GDH, Gal, and ALP were 10 U/L, and the concentrations of HSA and IgG were 150 mg/L. The concentrations of thrombin, Vc, GSH and amino acids were 0.1 mM, and the concentrations of metal ions and anion were 0.01 mM. F_0 and F are the fluorescence intensities of S, N-BQDs in the absence and presence of the possible coexistence substances, respectively.

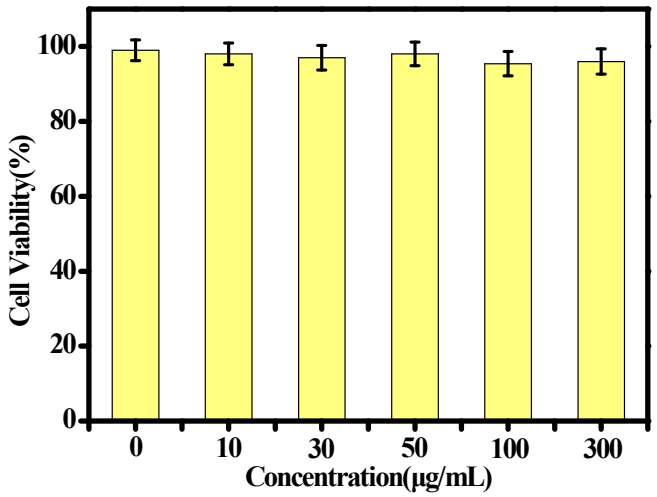

Fig. S7. Cells viability after incubation with S, N-BQDs for 24 h.

3. Supplementary Table

Table S1 Comparison of different methods used for thrombin detection

Method	Linear range(nM)	LOD (nM)	Reference
FRET assay	0-100	11	1
FRET assay	0-35	0.59	2
FRET assay	0-60	0.5	3
Fluorescence correlation spectroscopy	0.5-110	0.5	4
FRET assay	0.5-20	0.18	5
Conjugated polyelectrolyte fluorescence assay	–	0.175	6
Surface plasmon resonance assay	0.1-75	0.1	7
IFE fluorescence assay	0.1-65	0.03	This method

References

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