Electronic Supplementary Material (ESI) for Analyst.


# Supporting Information

# Carbon Dots as Analytical Tools for Sensing of Thioredoxin Reductase and Screening of Cancer Cells

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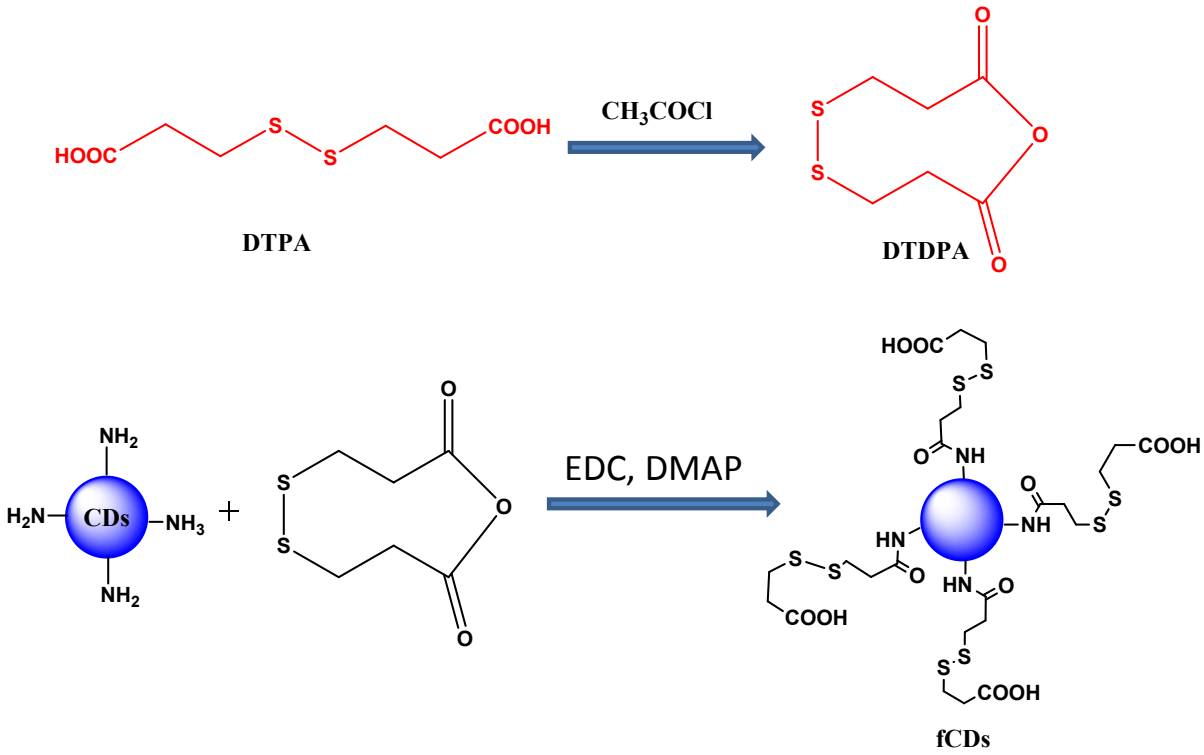


**Scheme S1:** Synthesis of DTDPA functionalized fCDs

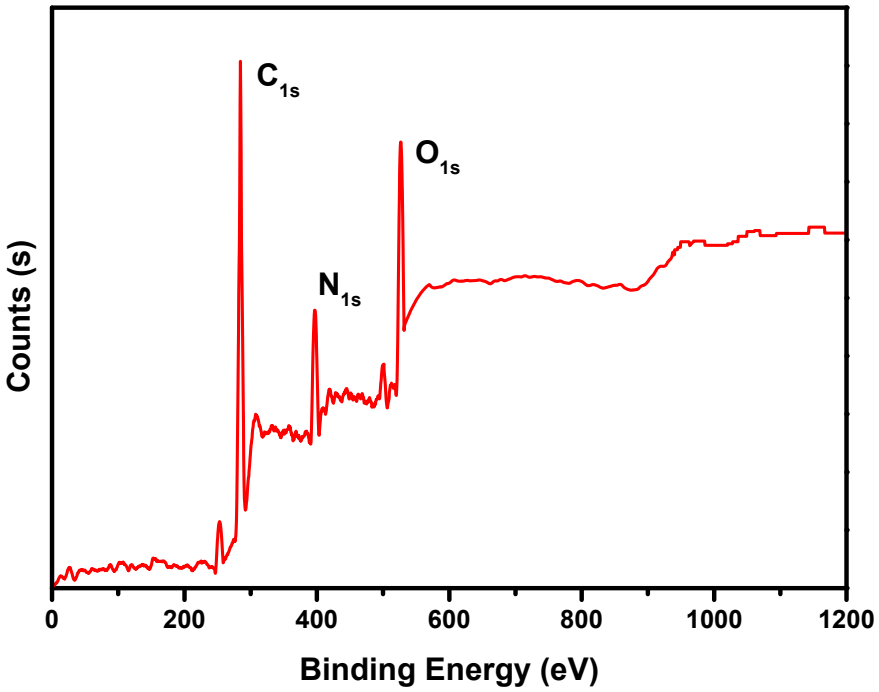


**Fig. S1:** XPS Spectra of CDs

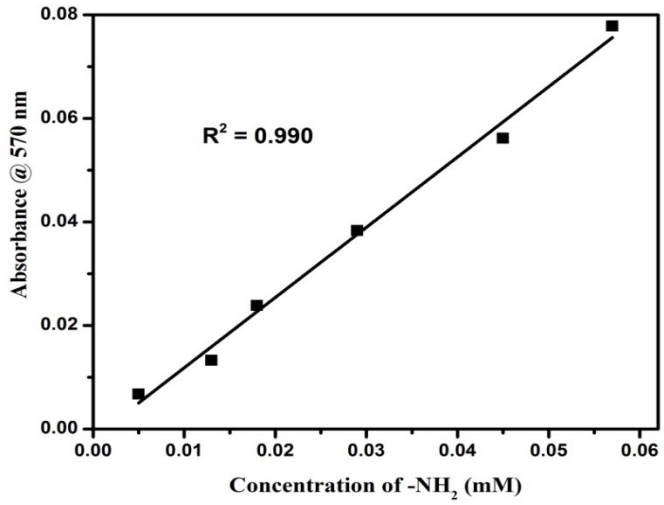


**Fig. S2** Linear Relationship Between the Absorbance of Ruhemann Purple with Alanine as Reference at 570 nm and concentration of amino group was found to be 1.30µg/mL

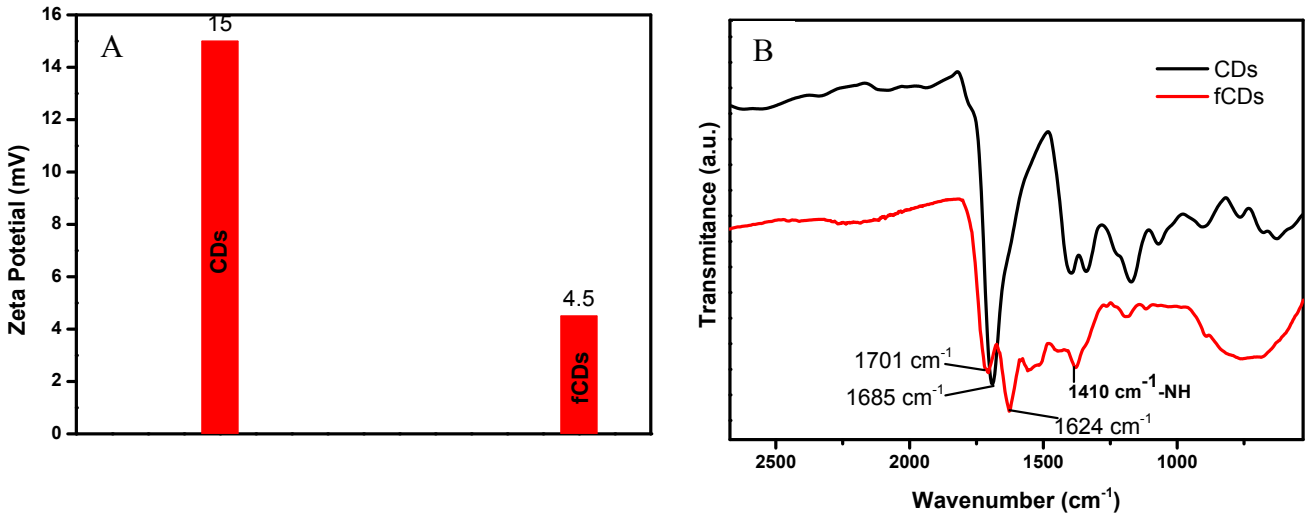


**Fig. S3 (A)** Zeta potential measurement of CDs (15 mV) and fCDs (4.5 mV) (**B**) FTIR spectra of CDs and fCDs

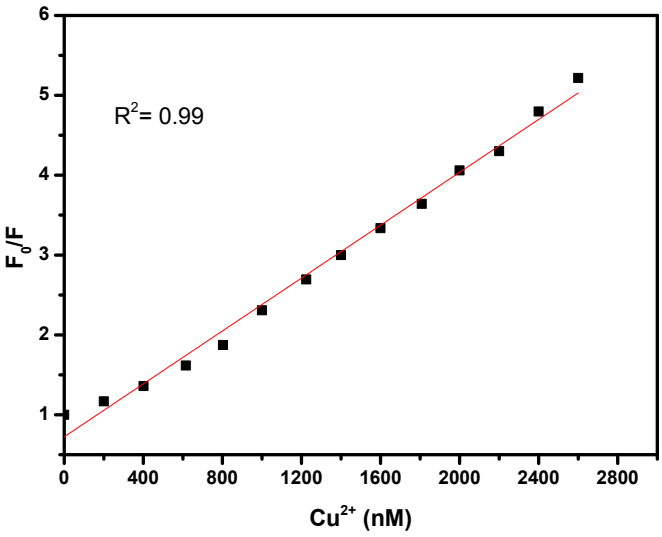


**Fig. S4** Stern-volmer plot of fCDs with increase in concentration of $Cu^{2+}$ and $K_{sv}$ was calculated to be $2.2 \times 10^{4}$. Intercept: $7.2 \times 10^{-1}$ and Slope: $2.1 \times 10^{-5}$

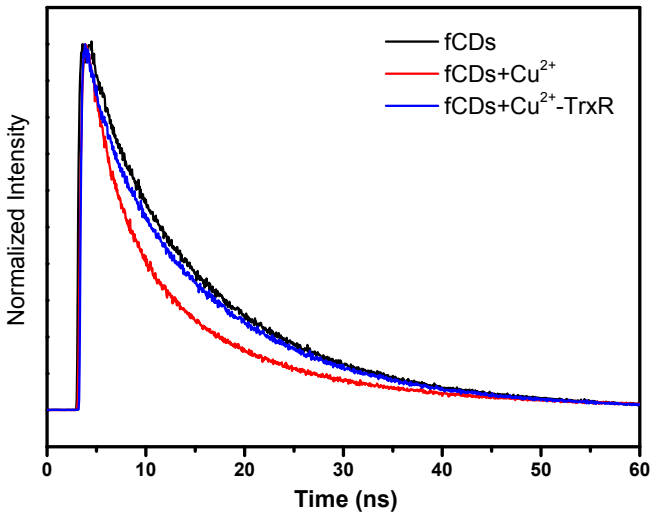


**Fig. S5** Fluorescence decay time study of fCDs, fCDs-$Cu^{2+}$ and fCDs-$Cu^{2+}$-TrxR. The average life time of fCDs was decreased from 7.1 ns to 3.7 ns in , fCDs-$Cu^{2+}$ indicates the ultrafast transfer of electron from CDs to $Cu^{2+}$ metal ion. After the addition of TrxR into sensor probe solution increased the average decay time (6.7 ns).

**Table. S1** Sensitivity Factor calculated in the presence of different disulfide reducing biomolecules

| **Analytes** | **Sensitivity Factor ($\Delta F/F_0$)** |
|---|---|
| **TrxR (100 nM)** | **8.7** |
| **GSH (1 mM)** | 0.37 |
| **GSH (5 mM)** | 0.65 |
| **Cys (1 mM)** | 0.43 |
| **GSH reductase (0.1 µM)** | 0.35 |
| **NADPH (200 µM)** | 0.13 |
| **TrxR (100 nM) + EDTA** | 9.0 |

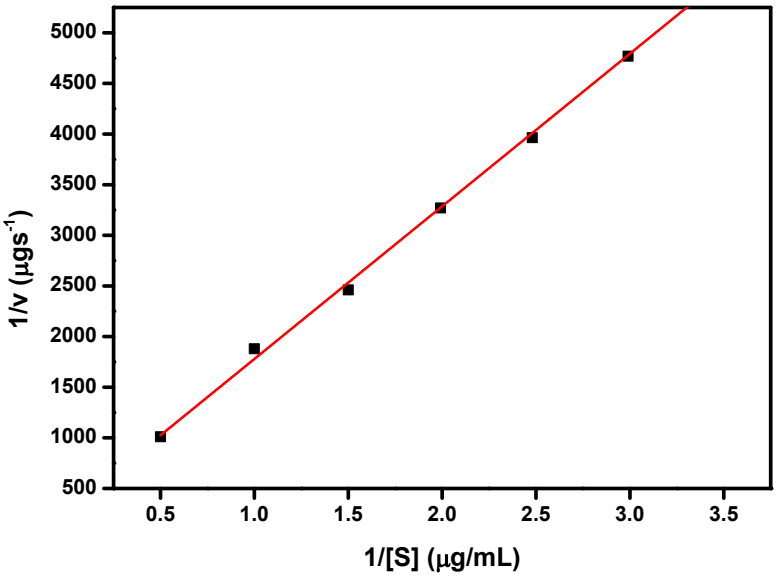


**Fig. S6** Km determination of fCDs-$Cu^{2+}$ (5.5 µg)

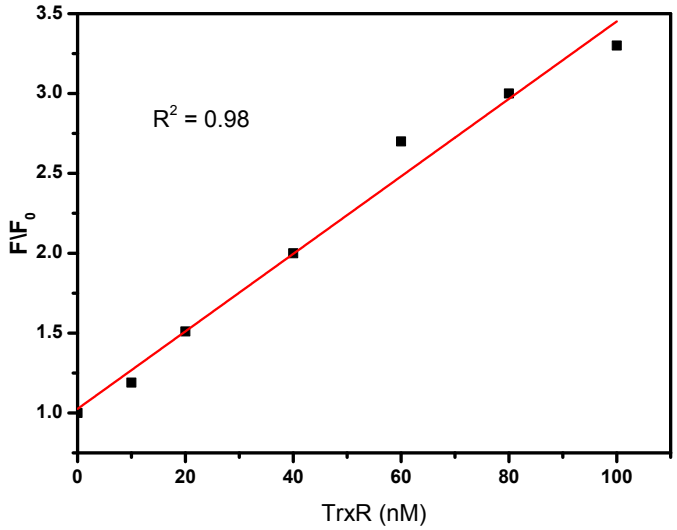


**Fig. S7** Limit of detection calculation of sensor probe for TrxR **(**LOD = 3×(0.017/0.0017) = 20 nM)

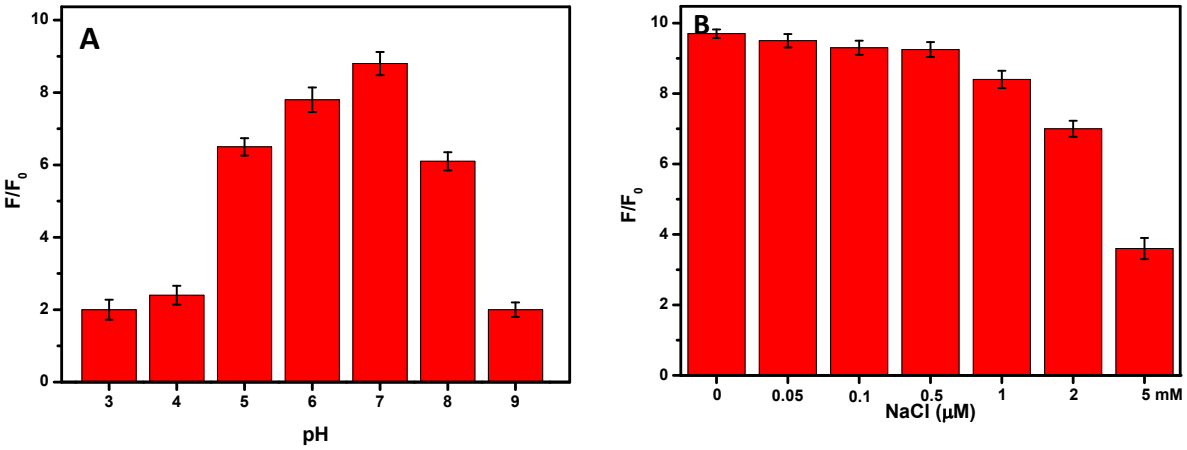


**Fig. S8** (**A**) Fluorescence response of fCDs-$Cu^{2+}$ in response to TrxR at different pH (**B**) Effect of salt concentration over sensitivity of fCDs-$Cu^{2+}$

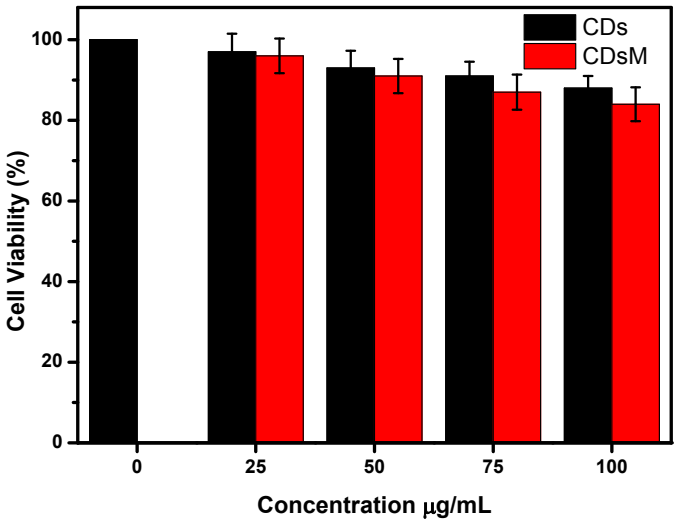


**Fig. S9** MTT assay of CDs and fCDs against MCF-7 cells

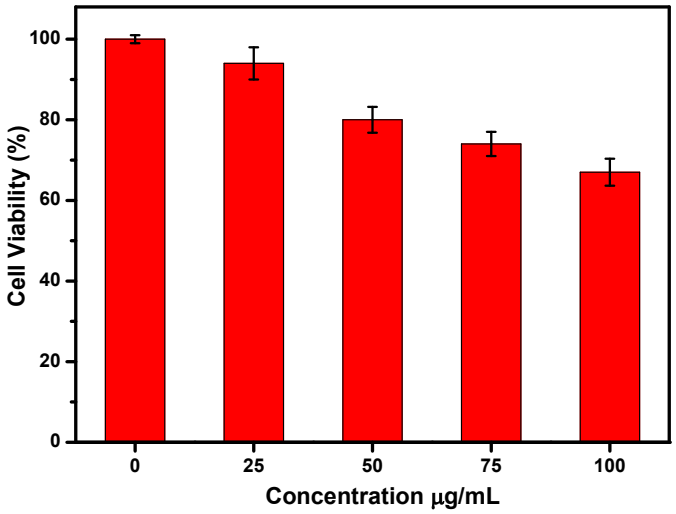


**Fig. 10** MTT assay of fCDs-$Cu^{2+}$ against MCF-7 cells

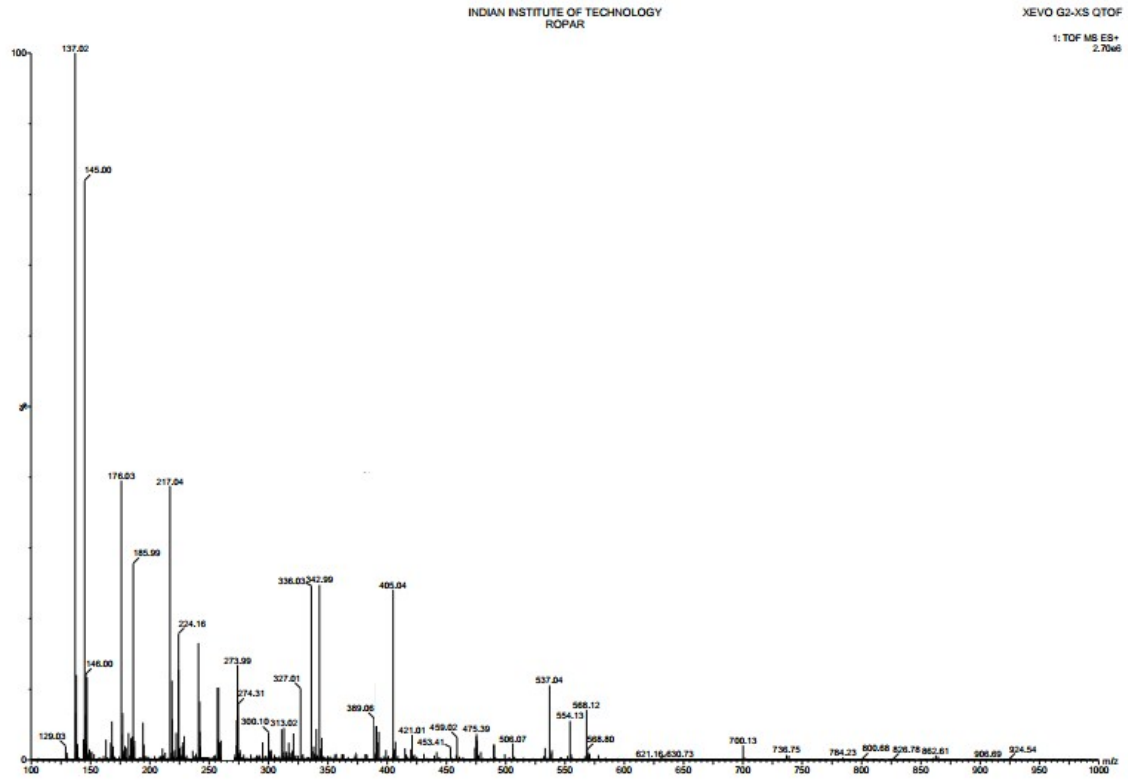


**Fig. S11** Mass spectra of CDsM-Cu

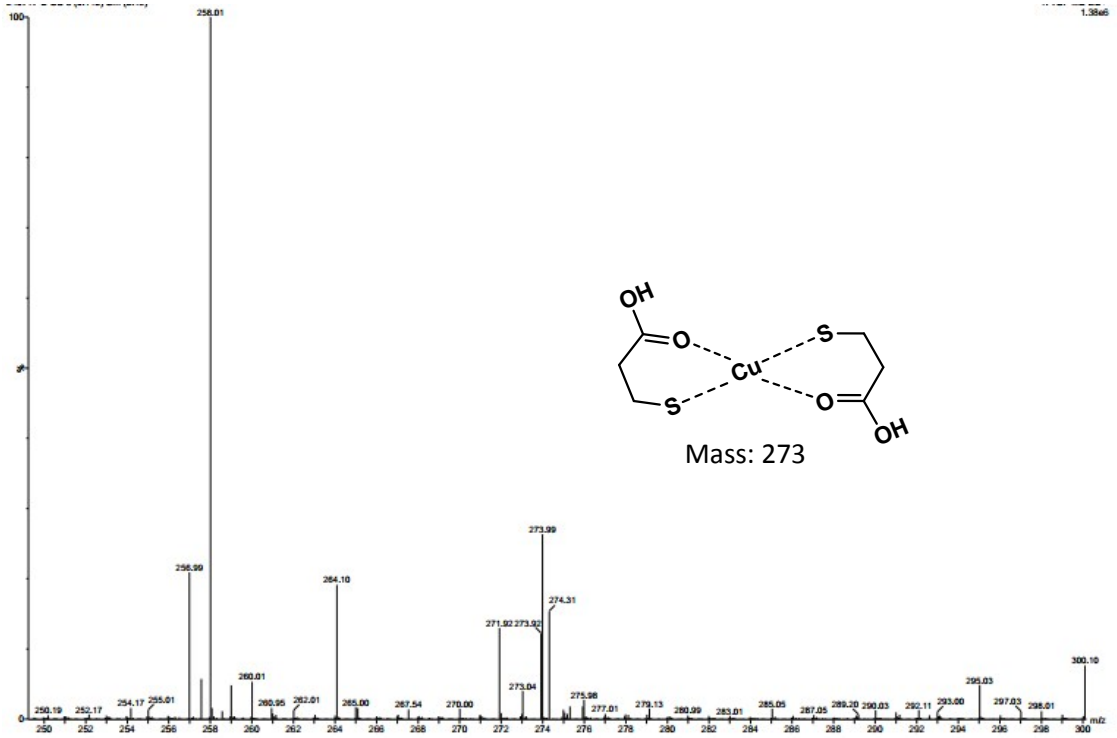


**Fig. S12** Mass spectra of CDsM-Cu after addition of TrxR (Incubation time was 2 h)