**Supplementary Information**

**Appendix A**

**A1 The study of Surface area and pore size of MSP**

The surface area and pore size of MSP were analyzed using the BET- Surface area and the BET- Isotherm plot. From the surface area plot, a series of the equation is obtained:

$\frac{P}{V\_{a}\left(P\_{0}-P\right)}=\frac{1}{V\_{m}C}+\frac{(C-1)}{V\_{m}C}\left(\frac{P}{P\_{0}}\right)$ (9)

$\frac{1}{V\_{m}C}=Intercept$ (10)

$\frac{(C-1)}{V\_{m}C}=Slope$ (11)

For the BET adsorption isotherm plot:

$S\_{BET}=\frac{4.355}{Slope+Intercept}$ (12)

$C\_{BET}=\frac{Slope}{Intercept}+1$ (13)

where V*m* is a monolayer volume,$ V\_{a}$ is the adsorbed volume C = CBET which is the BET constant and SBET is the surface area. Table A1 and A2 show the data used for the plots.

**Table A1:** BET analysis Isotherm linear plot (Moringa Adsorption).

|  |  |
| --- | --- |
| Relative Pressure (P/Po) | Quantity Adsorbed (cm³/g STP) |
| 0.057050800 | 0.888507971 |
| 0.099649602 | 1.215470488 |
| 0.149644114 | 1.564257622 |
| 0.199514608 | 1.867160519 |
| 0.249443844 | 2.111186746 |
| 0.299386124 | 2.284648505 |
| 0.993571648 | 15.88959158 |

**Table A2:** BET MOCP Surface Area plot.

|  |  |
| --- | --- |
| Relative Pressure (P/Po) | P/[Va(P0-P)] |
| 0.057050800 | 0.068095 |
| 0.099649602 | 0.091058 |
| 0.149644114 | 0.112500 |
| 0.199514608 | 0.133487 |
| 0.249443844 | 0.157421 |
| 0.299386124 | 0.187040 |

**A2 The Stern-Volmer analysis**

The binding constant and quenching constants of the CdSe-MSP complex at different concentrations of MSP were calculated using the Stern-Volmer equation [89]:

$\frac{F\_{0}}{F}=1+K\_{sv}\left[Q\right]$ (14)

$K\_{sv}=K\_{q}τ\_{0}$ (15)

F0 is the fluorescence intensity of pure CdSe QDs and F is the fluorescence intensities of protein (MSP) in the absence and presence of quencher (CdSe QDs), respectively. Ksv is the Stern-Volmer quenching constant and [Q] is the concentration of the quencher. Kq is the quenching constant and $τ\_{0}$ is the lifetime of the excited state in absence of a quencher. Equation (22) is equated to equation linear equation of a straight line.

**TableA3:** Fluorescence spectra intensities of CdSe-MSPn System

|  |  |  |
| --- | --- | --- |
| [CdSe-MSP mg/mL] | FL intensity (F) | Relative FL(F0/F) |
| 0 | F0= 683.65 |  |
| 10 | 620.93 | 1.10 |
| 25 | 412.38 | 1.66 |
| 50 | 286.52 | 2.39 |
| 80 | 188.07 | 3.64 |
| 100 | 158.11 | 4.32 |

**A3 Scatchard relation**

The number of binding sites (n) and the static quenching constant (K) which is the equilibrium constant in this present paper were calculated using the Scatchard relation approximation. The thermodynamic parameter the Gibbs free energy $∆G^{θ}, $ the enthalpy change $∆H^{θ}$, and the entropy change $∆S^{θ}$ were calculated using the equations below:

Scatchard relation:

$$log\left(\frac{F\_{0}-F}{F}\right)=LogK+nlog \left[Q\right] (16)$$

$$∆G^{θ}= -RT InK (17)$$

$$In\left(\frac{K\_{2}}{K\_{1}}\right)=\left(\frac{1}{T\_{2}}-\frac{1}{1}\right)\frac{∆H^{θ}}{R} \left(18\right)$$

$$InK^{θ}=-\frac{∆H^{θ}}{RT}+\frac{∆S^{θ}}{R} (19)$$

$$∆G^{θ}=∆H^{θ}-T∆S^{θ} (20)$$

where T is the temperature in (K) and R is the gas constant 8.314 JK-1mol-1. The interaction was carried temperatures 298.15 K and 313.15 K. From the Scatchard relation plot [22], equation (24) was equated to the equation of a straight line, thus the slope is equal to n and the y-intercept is the log. Therefore, the number of binding sites (n), and the binding constant which is also referred to as the equilibrium constant (K) was obtained.

**Table A4:** Scatchard relation plot for determination of thermodynamic potentials at T=298.15

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CdSe-MSPn (Mx10-6) | log [Q] | FL intensity (F) | (F0-F)/F | log[(F0-F)/F] |
| 0.769 | -6.11 | 620.93 | 0.10 | -1.00 |
| 1.92 | -5.72 | 412.38 | 0.66 | -0.18 |
| 3.85 | -5.41 | 286.52 | 1.39 | 0.14 |
| 6.15 | -5.21 | 188.07 | 2.64 | 0.42 |
| 7.69 | -5.11 | 158.11 | 3.32 | 0.52 |

**Table A5:** Scatchard relation plot for determination of thermodynamic potentials at T=313.15

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CdSe-MSPn (Mx10-6) | log [Q] | FL intensity (F) | (F0-F)/F | log[(F0-F)/F] |
| 0.769 | -6.11 | 600.84 | 0.05 | -1.30 |
| 1.92 | -5.72 | 504.70 | 0.25 | -0.60 |
| 3.85 | -5.41 | 216.80 | 1.91 | 0.28 |
| 6.15 | -5.21 | 156.94 | 3.02 | 0.48 |
| 7.69 | -5.11 | 124.43 | 4.07 | 0.61 |