SupplementaryInformation

Exploiting Biomimetic and Luminescence Properties of Multivalent Dendrimer-Semiconductor Nanohybrid Material in Ultra-Low Level Determination of Folic Acid

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Synthesis of Cysteine and BSA capped CdS QDs.

In a typical synthesis, an aqueous solution of L-cysteine (5×10^{-3}M) and Cd^{2+} ion (2×10^{-3} M) was prepared and pH was adjusted to 11.2–11.8 (using Jenway 3345 ion meter) by adding dilute NaOH solution. Then sodium sulfide (Na_2S)solution was injected under N_2-purged condition. The resultant solution was refluxed for five minute and a yellow colored solution of CdS QDs appeared. Final molar ratio of cysteine:Cd^{+2}:$S^{2-}$was kept as5:2:1. For synthesis of BSA capped CdS QDs, Cd^{2+} ion (2×10^{-3} M) was mixed with BSA solution at a concentration of BSA 3mg/mL.

Absorption spectroscopy for interaction of Dendrimer encapsulated ZnS QDs

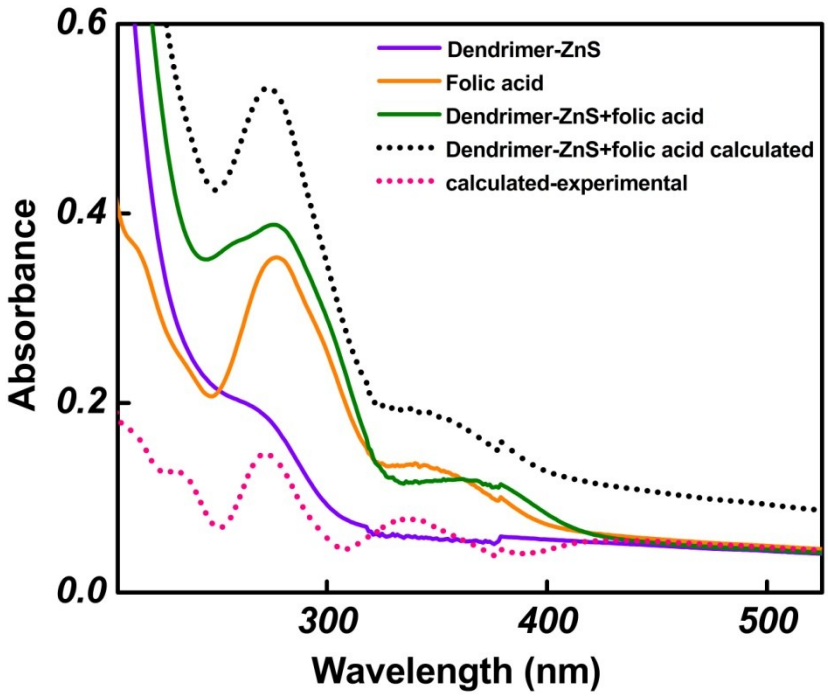

Fig S-1 Absorption spectra showing interactions of folic acid with dendrimer encapsulated ZnS QDs

Emission quenching behavior of Dendrimer-ZnS QDs on interaction of folic acid

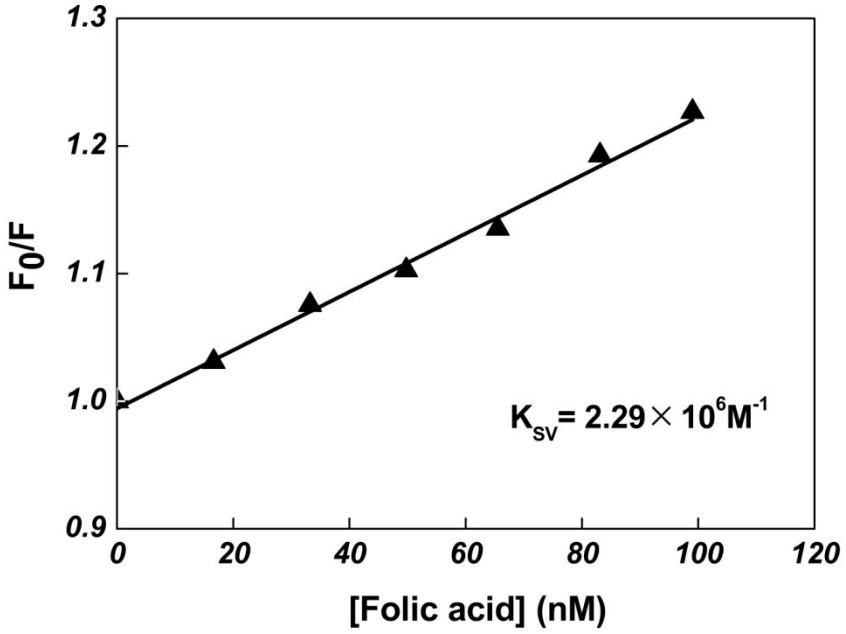

Fig S-2 Stern-Volmer plot on interaction of folic acid with dendrimer encapsulated ZnS QDs

TableS-1. Luminescence lifetime data at 510 nm on dendrimer encapsulated CdS QDs with excitation at 375nm with varying concentration of folic acid.

Folic Acid (nM)	τ_1 (ns)	τ_2 (ns)	A_1	A_2	τ_{av} (ns)	χ^2
0.0	2.86	31.40	53.01	46.99	28.74	1.14
66.2	2.88	30.15	55.79	44.21	27.21	1.08
131.5	3.69	32.93	55.84	44.16	29.30	0.98
196.0	3.92	32.50	59.75	40.25	25.16	0.99

Thermodynamics of interaction of folic acid with dendrimer and dendrimer encapsulated CdS QDs

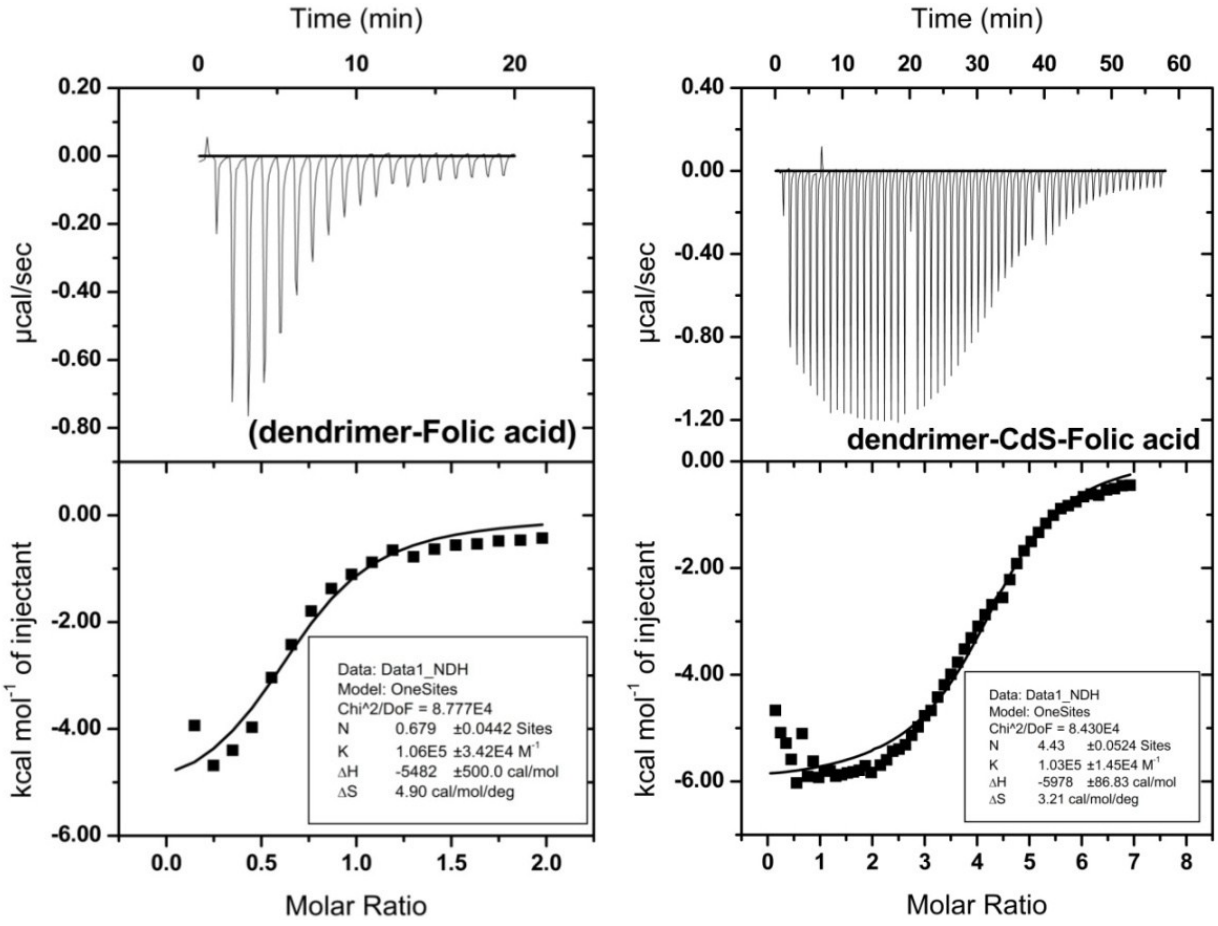

Figure S-3 Isothermal titration calorimetric analysis of dendrimer or dendrimer encapsulated CdS QDs with folic acid

Determination of folic acid in pharmaceutical samples

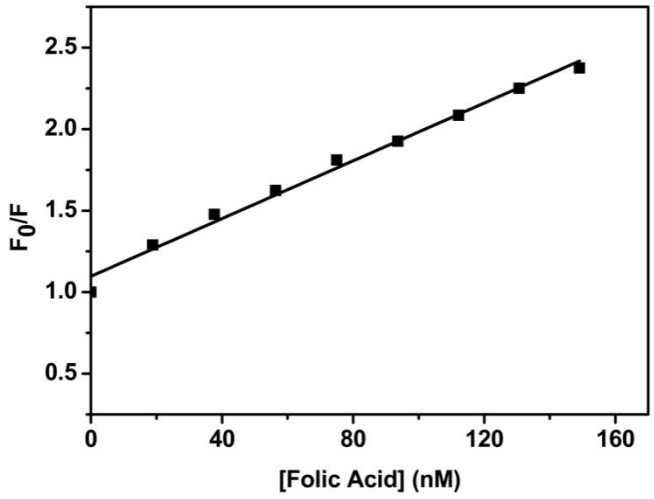

Figure S-4 Calibration curve for the determination folic acid in pharmaceutical tablets using dendrimer encapsulated CdS QDs.

Calculation of binding constant:

For static quenching, the relationship between fluorescence quenching intensity and the concentration of quenchers can be described by the equation given below[1, 2].

$$\frac{F_0 - F}{F - F_\infty} = \left(\frac{[FolicAcid]^n}{K_D}\right)$$

Where F∞ is the intensity of QDs saturated with the quencher. A typical doublelogarithm plot is shown in Fig. S-5. The value of log [Folic Acid] at log (F0−F)/(F−F∞)=0 equals the logarithm of dissociate constant (K_D) and the reciprocal of K_D is the binding constant (K_b).

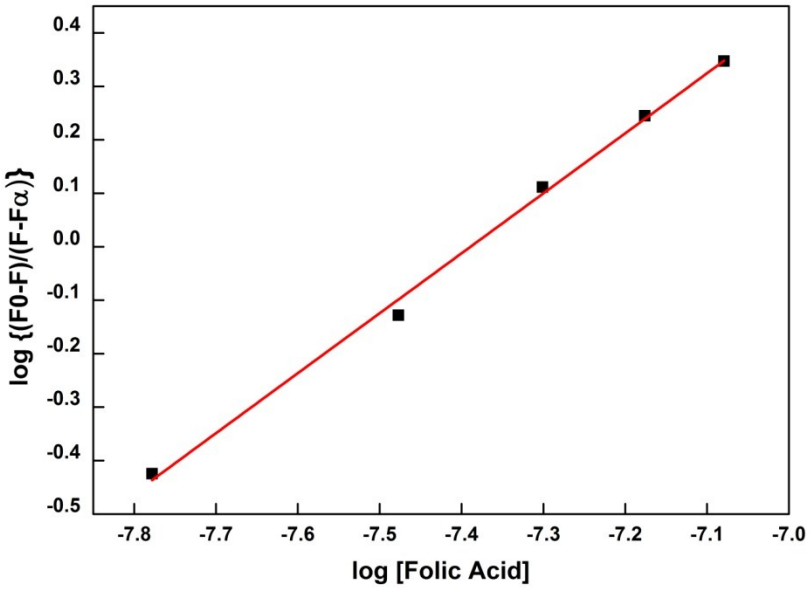

Fig S-5: plot for determination of binding constant of folic acid and dendrimer-CdS QDs.

References:

1. AC.Tedesco, DM.Oliveira, J Appl Phys, 2003,93, 6704–6706.
2. H. Xu, Q.Liu, Y.Wen, Spectrochim Acta Part A, **2008**, 71, 984–988.