Supplementry Information

Investigating binding of organic charge transfer co-crystal to human serum albumin by experimental and theoretical methods: Spectroscopy, molecular docking and DFT/TD-DFT studies

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Table S1. FT-IR Band Assignments (cm-1) for BTC, 2-EIM, and the CT Complex

Compound	Frequency (cm^{-1})	Assignments
1,2,4,5-Benzenetetracarboxylic acid		
	3439	O-H (free)str
	1668	>C=O
	1613	>C=C<
	1350/1267/1309	>C-O str ,
	981	C-C str
	1449	OH bend
	850	C-O wag assym
	691	O-H tors
	570	C-C tors ,O-H tors
2 – Ethylimidazole	3150	N-H str
	3108	C-H str
	1675	C=C ,C=N
	1575	N-H bending
	1453	CH2 bending
	1432	C-N ring
CT complex	3122	O-H str
	1625	>C=O
	1537	>C=C<

Table S2. Fractional Atomic Coordinates ($\times 10^4$) and Equivalent Isotropic Displacement Parameters ($Å^2 \times 10^3$) for CT complex. U_{eq} is defined as 1/3 of of the trace of the orthogonalised U_{IJ} tensor.

Atom	*x*	*y*	*z*	U(eq)
O2	2764(3)	2358.1(11)	5403.5(9)	47.9(4)
O3	5332(3)	5389.1(10)	6727.9(8)	48.7(4)
O1	-868(3)	2047.9(10)	4533.8(9)	50.0(4)
O4	4349(3)	7000.6(10)	6308.3(9)	53.2(4)
N1	7404(3)	2196.8(12)	6512.5(9)	38.6(4)
N2	10862(3)	1647.4(12)	7315.6(10)	39.3(4)
C9	1820(3)	5563.9(13)	5593.0(9)	27.6(4)
C7	205(3)	3878.3(12)	4926.6(9)	27.4(4)
C8	1929(3)	4468.9(13)	5496.5(10)	29.8(4)
C6	782(3)	2688.3(13)	4956.4(10)	33.0(4)
C10	3972(3)	6011.1(14)	6257.7(10)	31.7(4)
C3	8941(3)	1348.4(14)	6711.9(11)	36.5(4)
C1	8384(4)	3050.4(15)	6983.3(12)	44.1(5)
C2	10562(4)	2702.0(16)	7490.0(12)	46.0(5)
C4	8682(4)	296.9(16)	6289.2(15)	51.1(5)
C5	5847(4)	-135.6(18)	6166.6(16)	58.1(6)

Table S3. Anisotropic Displacement Parameters ($Å^2 \times 10^3$) for CT complex. The Anisotropic displacement factor exponent takes the form: $-2\pi^2[h^2a^{*2}U_{11}+2hka^*b^*U_{12}+\ldots]$.

Atom	U_{11}	U_{22}	U_{33}	U_{12}	U_{13}	U_{23}
O2	43.9(8)	35.0(7)	57.3(8)	8.1(6)	-25.0(6)	-1.4(6)
O3	51.5(8)	34.3(7)	50.7(8)	-0.5(6)	-33.6(6)	0.7(6)
O1	52.4(8)	28.3(7)	60.4(9)	-1.3(6)	-29.7(7)	-3.3(6)
O4	53.4(9)	30.4(7)	65.6(9)	-4.4(6)	-35.1(7)	-2.4(6)
N1	32.2(8)	39.8(9)	39.2(8)	5.6(6)	-14.6(6)	0.7(6)
N2	33.9(8)	37.0(8)	42.0(8)	6.0(6)	-15.5(6)	3.1(6)
C9	24.9(7)	29.7(8)	25.7(7)	-1.1(6)	-7.1(6)	-0.6(6)
C7	25.6(7)	27.4(8)	27.1(7)	-0.3(6)	-5.8(6)	0.6(6)
C8	26.4(8)	29.9(8)	30.0(8)	1.6(6)	-9.6(6)	2.0(6)
C6	33.3(9)	29.0(8)	33.6(8)	2.2(7)	-9.4(7)	-0.8(6)
C10	28.4(8)	32.5(8)	30.6(8)	-1.1(6)	-10.6(6)	-2.0(6)
C3	29.1(8)	35.4(9)	41.7(9)	1.7(7)	-9.0(7)	2.9(7)
C1	46.0(10)	34.6(10)	47.5(10)	9.6(8)	-11.9(8)	-2.6(8)
C2	47.4(11)	39.3(10)	45.8(10)	5.2(8)	-17.5(9)	-6.9(8)
C4	39.8(10)	39.5(11)	70.0(14)	1.9(8)	-8.9(9)	-6.4(10)
C5	47.0(12)	46.5(12)	75.9(15)	-1.9(10)	-12.8(11)	-7.6(11)

Table S4. Bond Lengths for CT complex.

Atom	Atom	Length/Å	Atom	Atom	Length/Å
O2	C6	1.219(2)	C9	C7[1]	1.413(2)
O3	C10	1.232(2)	C9	C8	1.391(2)
O1	C6	1.284(2)	C9	C10	1.524(2)
O4	C10	1.262(2)	C7	C8	1.391(2)
N1	C3	1.330(2)	C7	C6	1.527(2)
N1	C1	1.370(2)	C3	C4	1.488(3)
N2	C3	1.330(2)	C1	C2	1.346(3)
N2	C2	1.370(2)	C4	C5	1.498(3)

Table S5. Bond Angles for CT complex.

Atom	Atom	Atom	Angle/°	Atom	Atom	Atom	Angle/°
C1	N1	C3	110.10(15)	C7	C6	O1	119.72(14)
C2	N2	C3	109.78(15)	O4	C10	O3	121.55(14)
C8	C9	C7[1]	117.54(14)	C9	C10	O3	118.68(15)
C10	C9	C7[1]	128.14(15)	C9	C10	O4	119.76(14)
C10	C9	C8	114.32(14)	N2	C3	N1	106.69(16)
C8	C7	C9[1]	117.33(15)	C4	C3	N1	126.23(16)
C6	C7	C9[1]	128.66(14)	C4	C3	N2	126.90(16)
C6	C7	C8	114.01(13)	C2	C1	N1	106.45(16)
C7	C8	C9	125.13(14)	C1	C2	N2	106.97(16)
O1	C6	O2	120.96(16)	C5	C4	C3	114.35(18)
C7	C6	O2	119.27(15)				

Table S6. Hydrogen Atom Coordinates (Å×10^4) and Isotropic Displacement Parameters (Å^2×10^3) for CT complex.

Atom	*x*	*y*	*z*	U(eq)
H1	6000(3)	2208.1(12)	6142.0(9)	46.4(5)
H2	12105(3)	1240.1(12)	7560.0(10)	47.1(5)
H8	3259(3)	4102.8(13)	5839.9(10)	35.8(4)
H1a	7682(4)	3735.4(15)	6957.8(12)	52.9(6)
H2a	11656(4)	3101.0(16)	7883.6(12)	55.2(6)
H4a	9335(4)	358.0(16)	5745.8(15)	61.3(6)
H4b	9843(4)	-206.1(16)	6618.8(15)	61.3(6)
H5a	4656(8)	374(6)	5869(10)	87.1(9)
H5b	5816(8)	-781(7)	5849(9)	87.1(9)
H5c	5253(14)	-276(13)	6703.0(16)	87.1(9)

Table S7. BTC, 2-EIM, and [(BTC)(2-EIM)] CT complex weight loss (%), enthalpy (H), and degradation temperature (T).

Step	1,24,5-benzenetetracarboxylic acid Weight loss (%)	T (°C)	ΔH (J/g)	2-Eth-ylimidazol Weight loss (%)	T(°C)	ΔH(J/g)	CT(complex) Weight loss (%)	T (°C)	ΔH (J/g)
1	-14.03 -87.30	92.04 290.8	-99.81 -18.62	99.8	222	-06.27	-86.95	234.55	-109.4

Table S8. Docking log file of HAS-CT complex system (saving top 9 orientations), E_{min} = -8.8 kcal/mol.

mode |	affinity | (kcal/mol)	dist from best mode rmsdl.b.|	rmsdu.b.
1	-8.8	0.000	0.000
2	-8.2	1.876	3.685
3	-8.2	2.239	3.086
4	-8.0	1.554	3.759
5	-7.9	14.290	16.498
6	-7.7	18.464	20.554
7	-7.6	4.343	7.135
8	-7.5	19.653	21.920
9	-7.3	19.415	23.412

Steady-state fluorescence study of HSA with CTC; excitation of Tryptophan only:

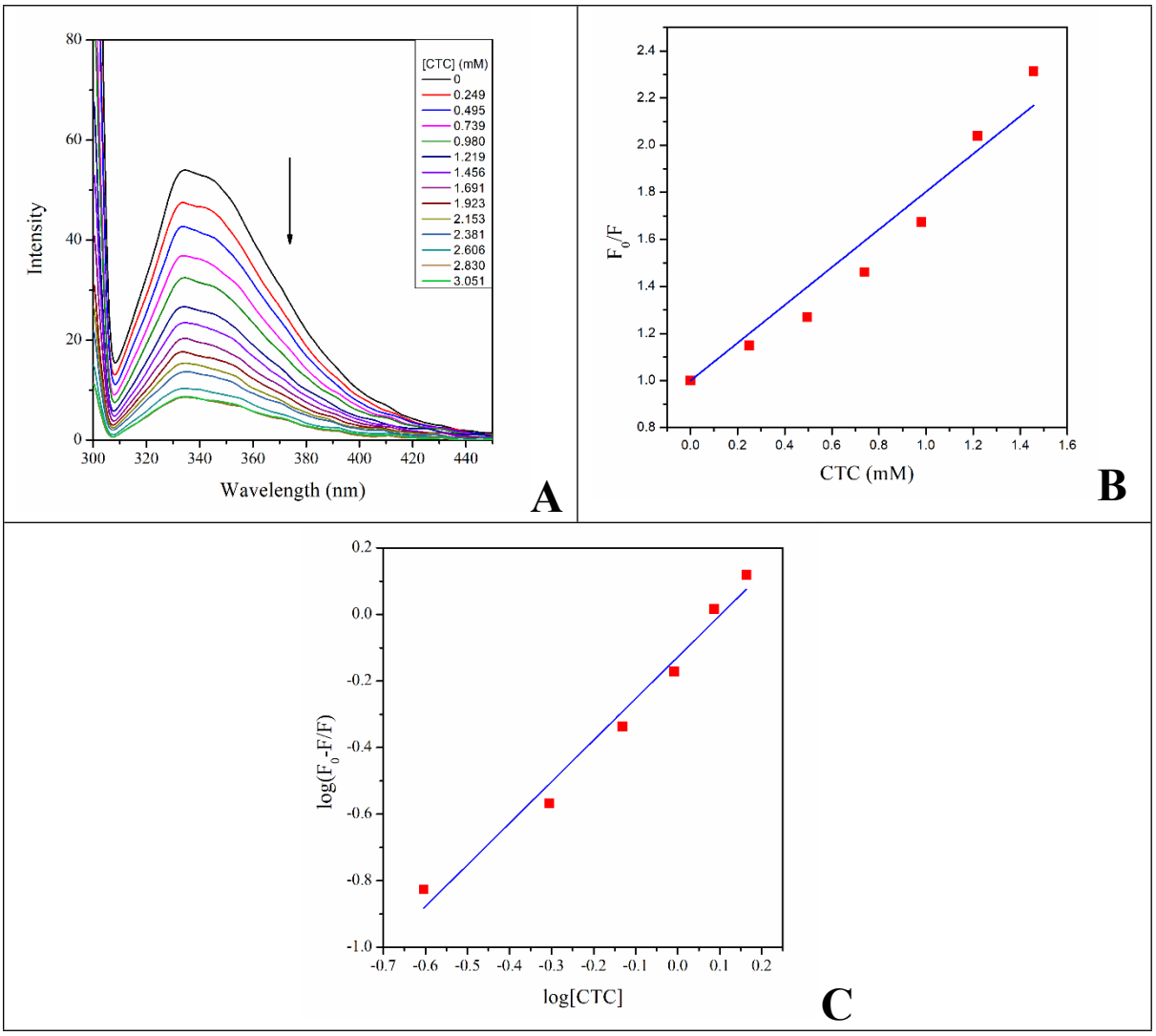

Figure S1. Tryptophan excitation of HSA at 295 nm and its titration with CTC; [A] quenching of the intensity maxima of HSA upon addition of CTC, [B] Stern-volmer plot, [C] modern Stern-volmer plot for determination of binding constant.

Table S9. Quenching and binding parameters obtained for HSA and CTC interaction from spectrofluorometric study

	$K_{SV}(M^{-1})$	$k_q(M^{-1}s^{-1})$	R^2	$K_b(M^{-1})$	n	R^2	ΔG (kJ mol^{-1})
CT Complex	8.02×10^2	8.02×10^{10}	0.99	7.44×10^2	1.24	0.98	-16.384

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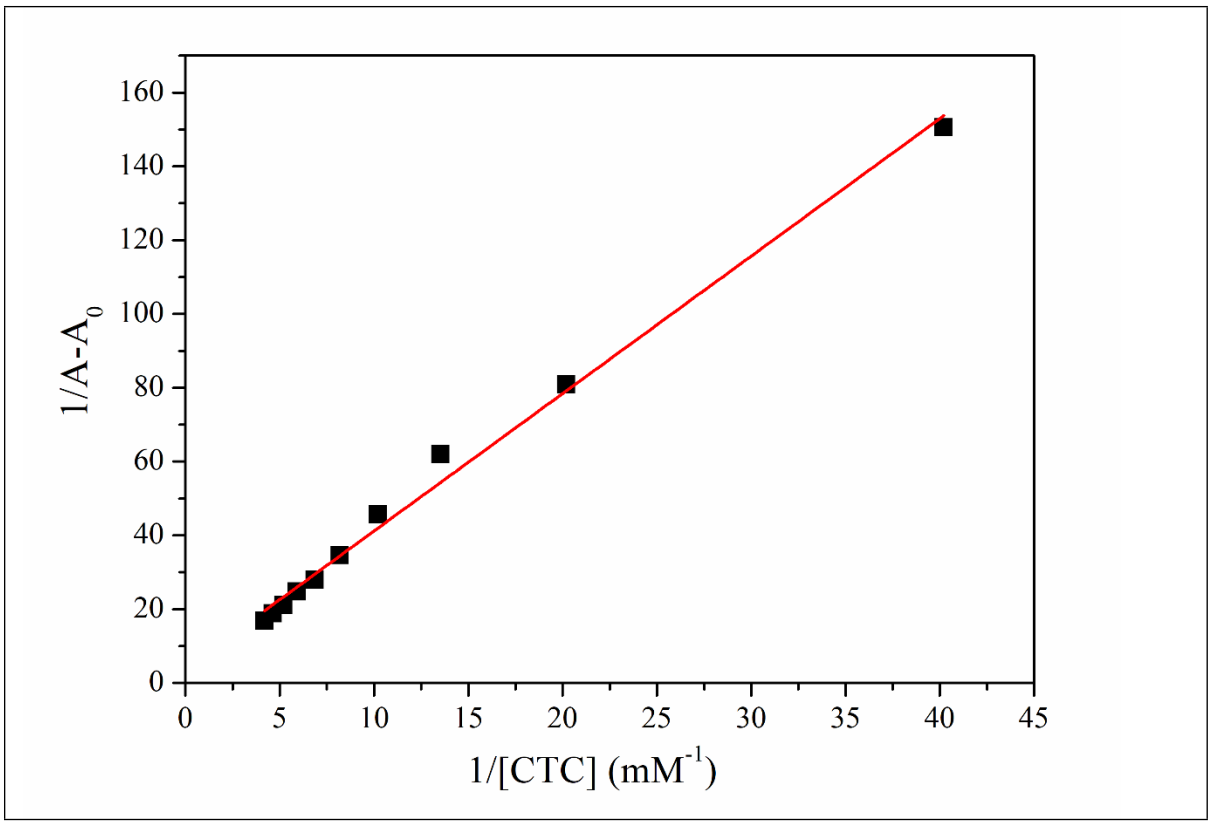

Figure S2. The Benesi–Hildebrand plots to determine binding constant using changes in absorption spectra of HAS-CT complex.