Electronic Supplementary Data

Sulfur-Induced Chirality Changes in Single-Walled Carbon Nanotube Synthesis by Ethanol Chemical Vapor Deposition on Co/SiO_2 Catalyst

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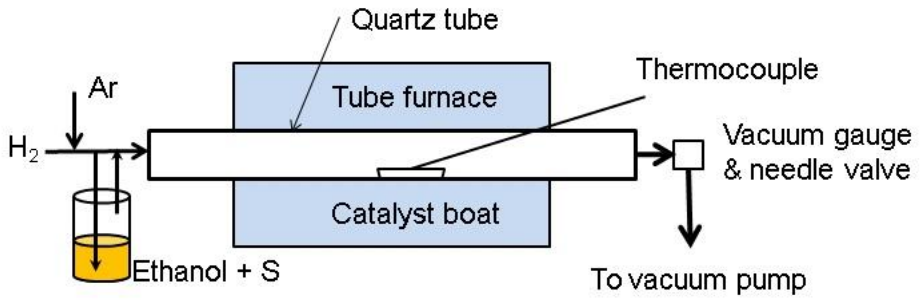

Figure S1. A schematic drawing of the ethanol chemical vapor deposition reactor

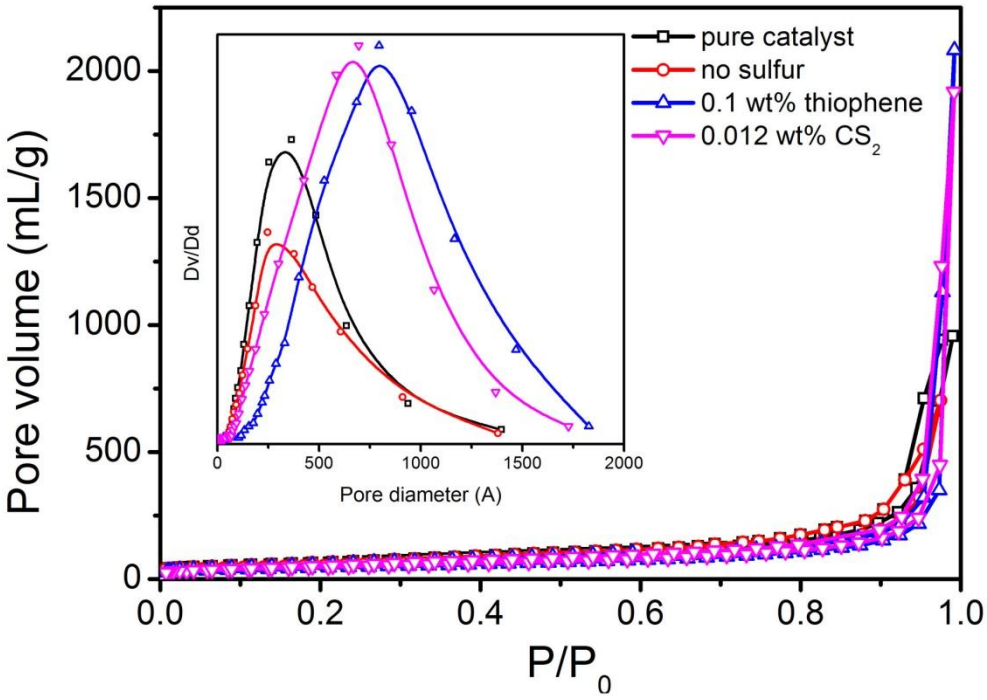

Figure S2. Nitrogen physisorption of the Co/SiO_2 catalysts: after calcination, SWCNT growth without sulfur addition, with 0.1 wt% thiophene, and with 0.012 wt% CS_2. The inserts show the pore size distribution determined by the Barrett, Joyner, and Halenda (BJH) method.

Table S1 Surface area, average pore size and pore volume of Co/SiO_2 catalysts at different conditions.

Catalysts	Carbon yield (wt%)	Surface area (m^2/g)	Average pore size (nm)	Pore volume (mL/g)
After calcination	0	227	35	1.5
No sulfur addition	4.8	193	23	1.1
0.1 wt% thiophene	0.4	164	78	3.2
0.012 wt% CS_2	0.1	172	68	2.9

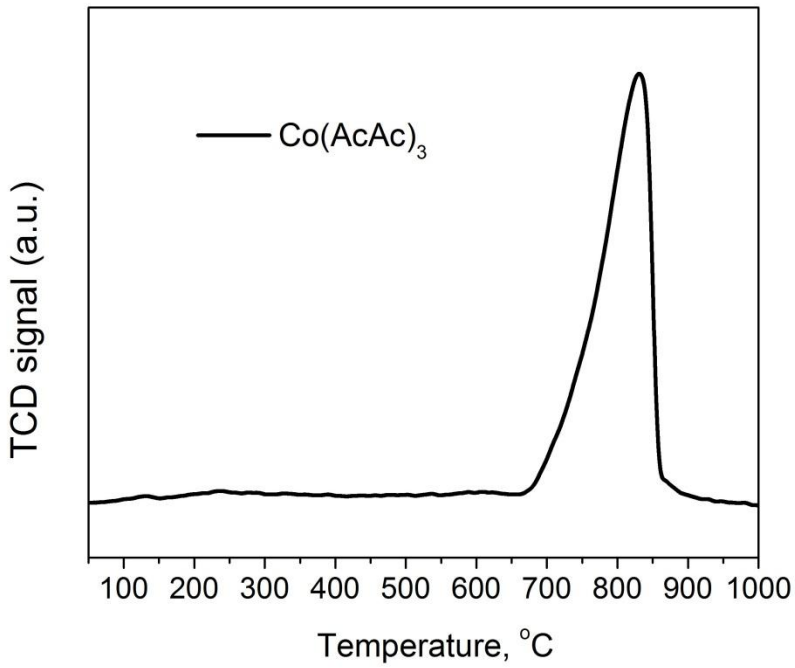

Figure S3. H_2-temperature-programed reduction profile of the Co/SiO_2 catalyst.

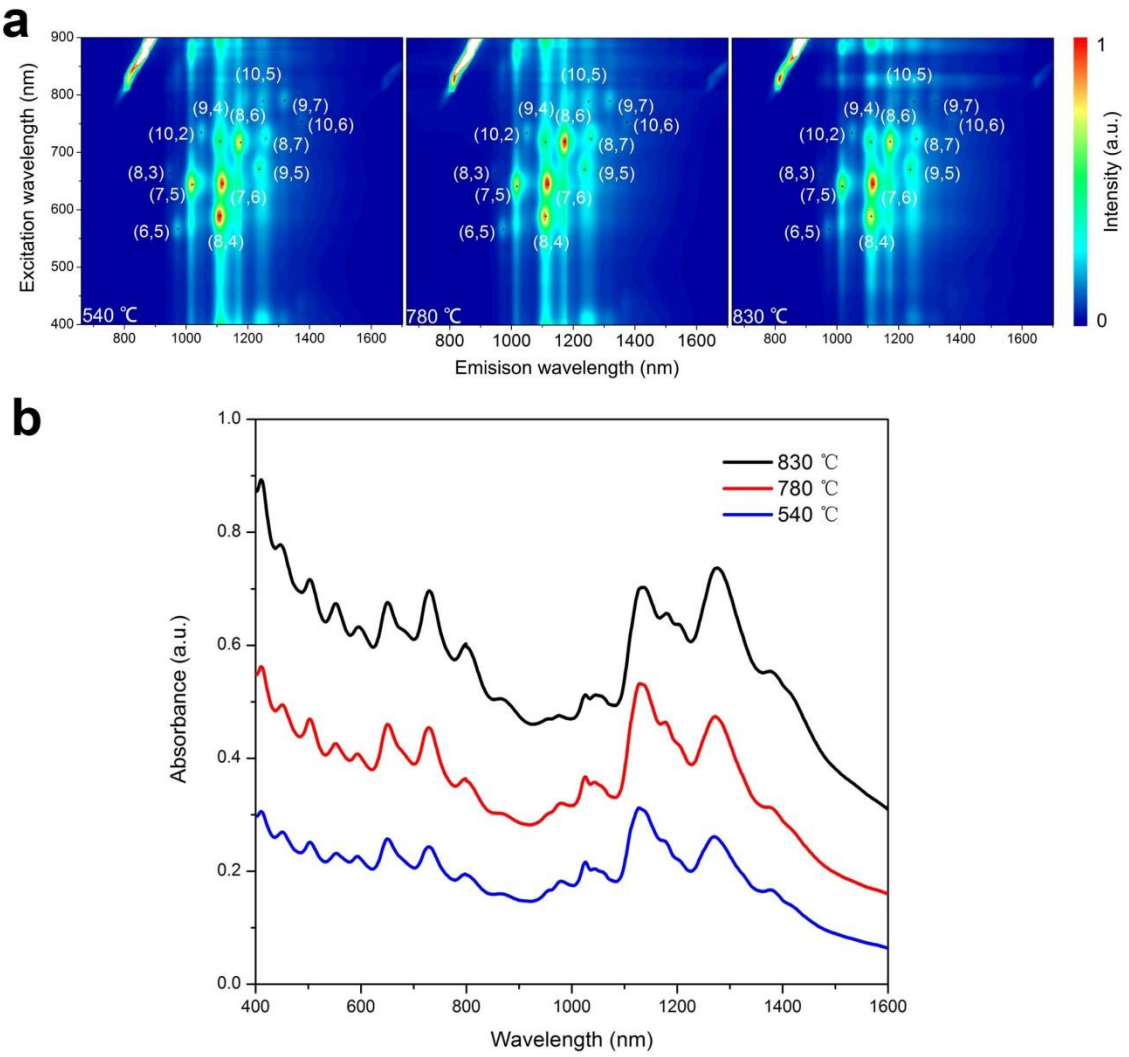

Figure S4. (a) PL contour plots as a function of excitation and emission energies and (b) UV-vis-NIR absorption spectra of SDBS-dispersed SWCNTs grown on the Co/SiO_2 catalyst after catalyst reduction in H_2 at three different temperatures.

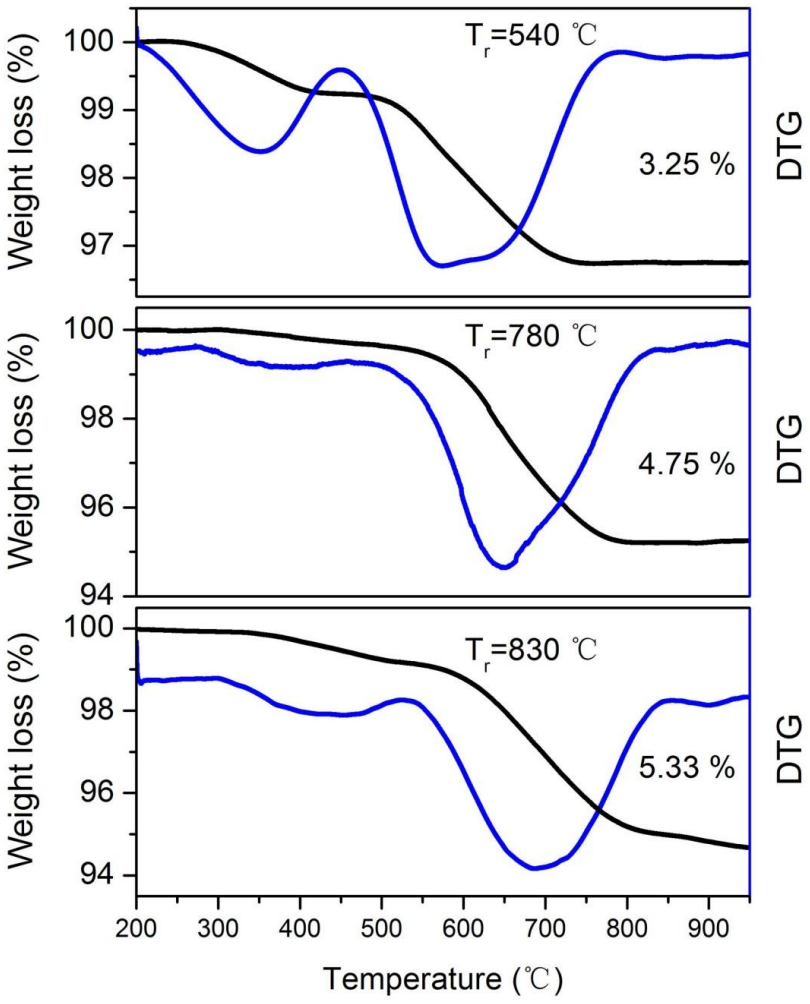

Figure S5. TG and DTG profiles of carbon deposits grown on the Co/SiO_2 catalyst after catalyst reduction in H_2 at three different temperatures.

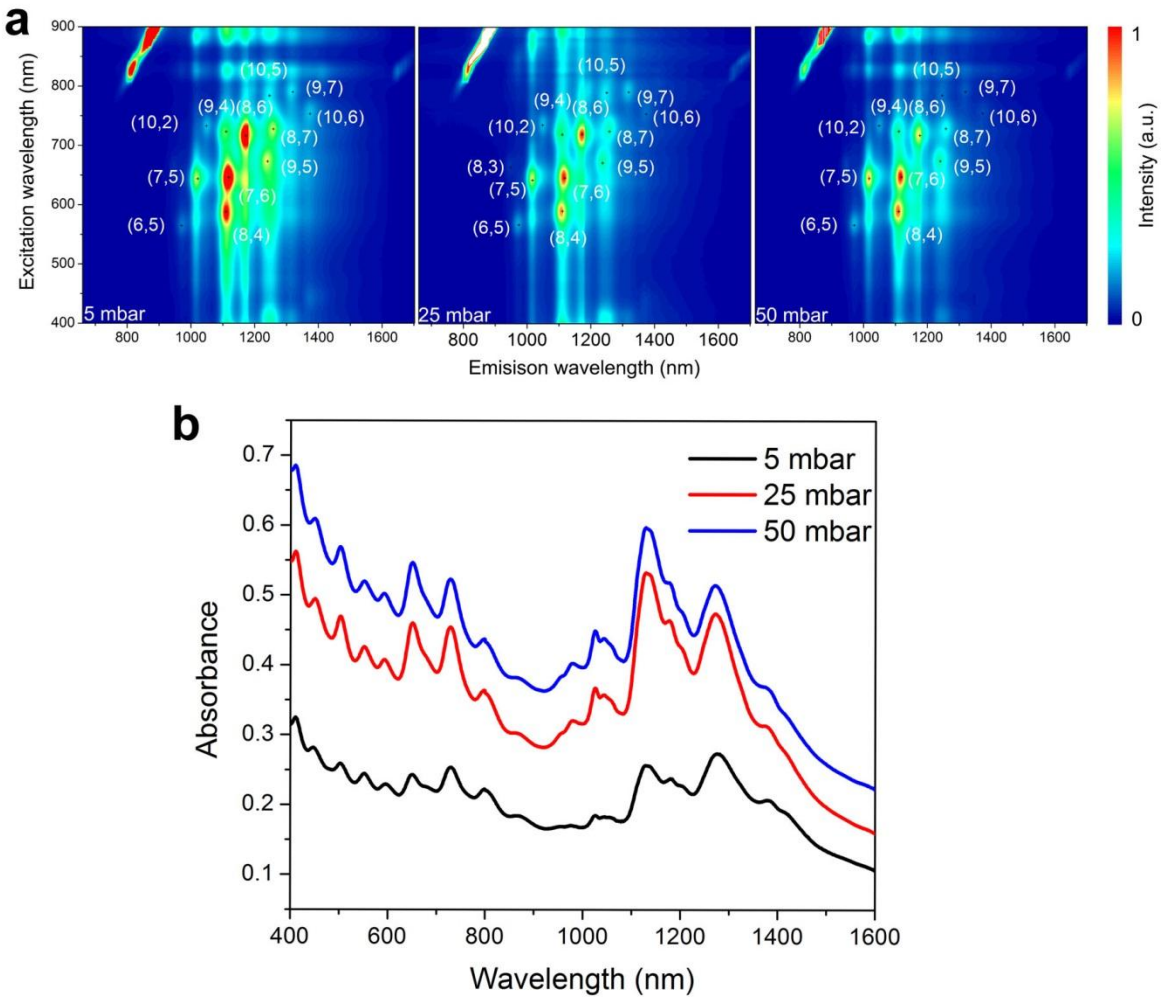

Figure S6. (a) PL contour plots as a function of excitation and emission energies and (b) UV-vis-NIR absorption spectra of SDBS-dispersed SWCNTs grown from Co/SiO_2 at different ethanol pressures.

Table S2. Tabulated values of PL peak intensity and the relative abundance of (n,m) species in SWCNTs grown on Co/SiO_2 after adding different amounts of carbon disulfide in ethanol

(n,m) index	D (n,m)	Carbon disulfide content in ethanol (wt%)																	
		0		0.0001		0.001		0.006		0.008		0.01		0.012		0.023		0.045	
		PL*	A**	PL	A	PL	A	PL	A	PL	A	PL	A	PL	A	PL	A	PL	A
(6,5)	0.76	535	2.4	1080	4.4	1655	4.5	1656	3.8	1355	3.6	1088	3.7	289	2.5	189	3.4	173	3.8
(8,3)	0.78	670	3.1	507	2.0	652	1.8	759	1.7	606	1.6	458	1.6	134	1.2	93	1.7		
(7,5)	0.83	2646	12.1	4571	18.4	4632	12.5	5097	11.7	3592	9.5	1971	6.8	466	4.0	300	5.4	224	5.0
(8,4)	0.84	3609	16.5	5004	20.2	5239	14.1	5210	12.0	4601	12.2	2748	9.4	732	6.3	466	8.4	344	7.6
(10,2)	0.88	666	3.0	950	3.8	1401	3.8	1481	3.4	1087	2.9	589	2.0	180	1.6	126	2.3	104	2.3
(7,6)	0.90	4200	19.1	4632	18.7	5237	14.1	5162	11.9	4431	11.7	3052	10.5	1026	8.9	616	11.2	532	11.8
(9,4)	0.92	1871	8.5	1809	7.3	3051	8.2	2831	6.5	2100	5.6	1337	4.6	465	4.0	283	5.1	255	5.7
(8,6)	0.97	3926	17.9	2604	10.5	4933	13.3	5182	11.9	4498	11.9	3330	11.4	1330	11.5	641	11.6	548	12.2
(9,5)	0.98	1210	5.5	1435	5.8	3117	8.4	4487	10.3	3691	9.8	3314	11.4	1439	12.4	594	10.8	492	10.9
(8,7)	1.03	1200	5.5	1161	4.7	3037	8.2	5136	11.8	5054	13.4	5158	17.7	2387	20.6	996	18.0	668	14.8
(9,7)	1.10	693	3.2	380	1.5	1963	5.3	2679	6.2	2816	7.5	2441	8.4	1206	10.4	494	8.9	423	9.4
(10,6)	1.11	391	1.8	326	1.3	1214	3.3	1973	4.5	1798	4.8	1624	5.6	797	6.9	306	5.5	354	7.9
(9,8)	1.17	320	1.5	317	1.3	996	2.7	1836	4.2	2082	5.5	1976	6.8	1141	9.8	416	7.5	383	8.5

* PL peak intensity (counts); ** Relative abundance (%)

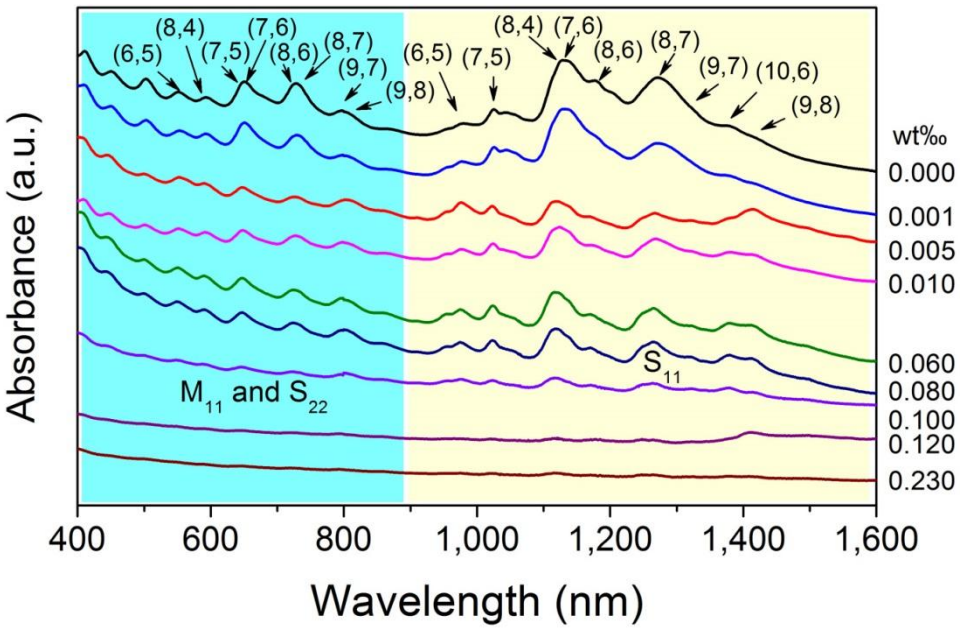

Figure S7. UV-vis-NIR absorption spectra of SDBS-dispersed SWCNTs grown from Co/SiO_2 after adding different amounts of carbon disulfide in ethanol. The label S_{11} (shaded yellow) marks the excitonic optical absorption bands for semiconducting SWCNTs corresponding to the first one-dimensional van Hove singularities; the S_{22} and E_{11} (shaded blue) correspond to the overlapping absorption bands of the first van Hove singularities from metallic SWCNTs and the

second van Hove singularities from semiconducting SWCNTs. All spectra were shifted in y-axis for easy comparison.

Table S3. Tabulated values of PL peak intensity and the relative abundance of (n,m) species in SWCNTs grown on Co/SiO_2 after adding different amounts of thiophene in ethanol.

(n,m) index	D (n,m)	Thiophene content in ethanol (wt%)																	
		0		0.001		0.005		0.01		0.05		0.075		0.1		0.125		0.2	
		PL*	A**	PL	A	PL	A	PL	A	PL	A	PL	A	PL	A	PL	A	PL	A
(6,5)	0.76	535	2.4	1918	6.1	2311	5.1	1316	3.3	2785	9.3	980	5.6	123	3.2	563	3.6	1405	7.6
(8,3)	0.78	670	3.1	991	3.1	706	1.6	568	1.4	465	1.6	211	1.2						
(7,5)	0.83	2646	12.1	4394	13.9	4404	9.8	3602	9.0	2020	6.8	710	4.1	80	2.1	571	3.7	1107	6.0
(8,4)	0.84	3609	16.5	5249	16.6	4964	11.0	5058	12.6	3589	12.0	1252	7.2	160	4.1	1007	6.5	1654	8.9
(10,2)	0.88	666	3.0	1394	4.4	965	2.1	998	2.5										
(7,6)	0.90	4200	19.1	5091	16.1	6851	15.2	5814	14.5	4104	13.7	1498	8.6	235	6.1	1471	9.4	2756	14.8
(9,4)	0.92	1871	8.5	2153	6.8	2223	4.9	2071	5.2	1240	4.1	575	3.3	82	2.1	547	3.5	789	4.2
(8,6)	0.97	3926	17.9	4088	13.0	5964	13.2	5084	12.7	2901	9.7	1663	9.6	155	4.0	1547	9.9	1857	10.0
(9,5)	0.98	1210	5.5	2088	6.6	4960	11.0	4258	10.6	2447	8.2	1697	9.8			1469	9.4	1413	7.6
(8,7)	1.03	1200	5.5	1967	6.2	4951	11.0	5054	12.6	4016	13.4	2882	16.6	591	15.3	2691	17.2	2636	14.2
(9,7)	1.10	693	3.2	944	3.0	3056	6.8	2511	6.3	2435	8.1	1913	11.0	557	14.4	1742	11.2	1732	9.3
(10,6)	1.11	391	1.8	778	2.5	2290	5.1	1997	5.0	1612	5.4	1227	7.1	314	8.1	1120	7.2	1145	6.2
(9,8)	1.17	320	1.5	508	1.6	1474	3.3	1797	4.5	2307	7.7	2773	16.0	1566	40.5	2884	18.5	2090	11.2

* PL peak intensity (counts); ** Relative abundance (%)

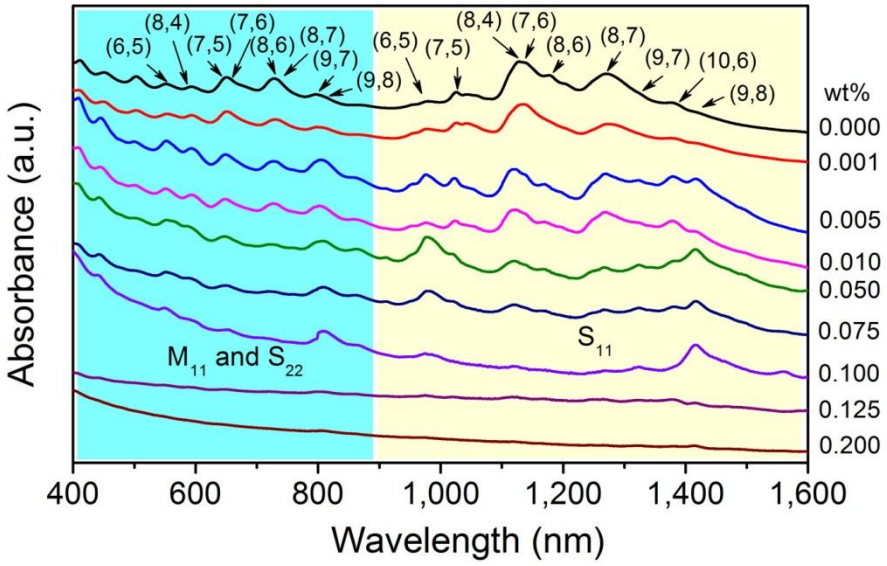

Figure S8. UV-vis-NIR absorption spectra of SDBS-dispersed SWCNTs grown from Co/SiO_2 after adding different amounts of thiophene in ethanol. All spectra were shifted in y-axis for easy comparison.