

Supplementary Information

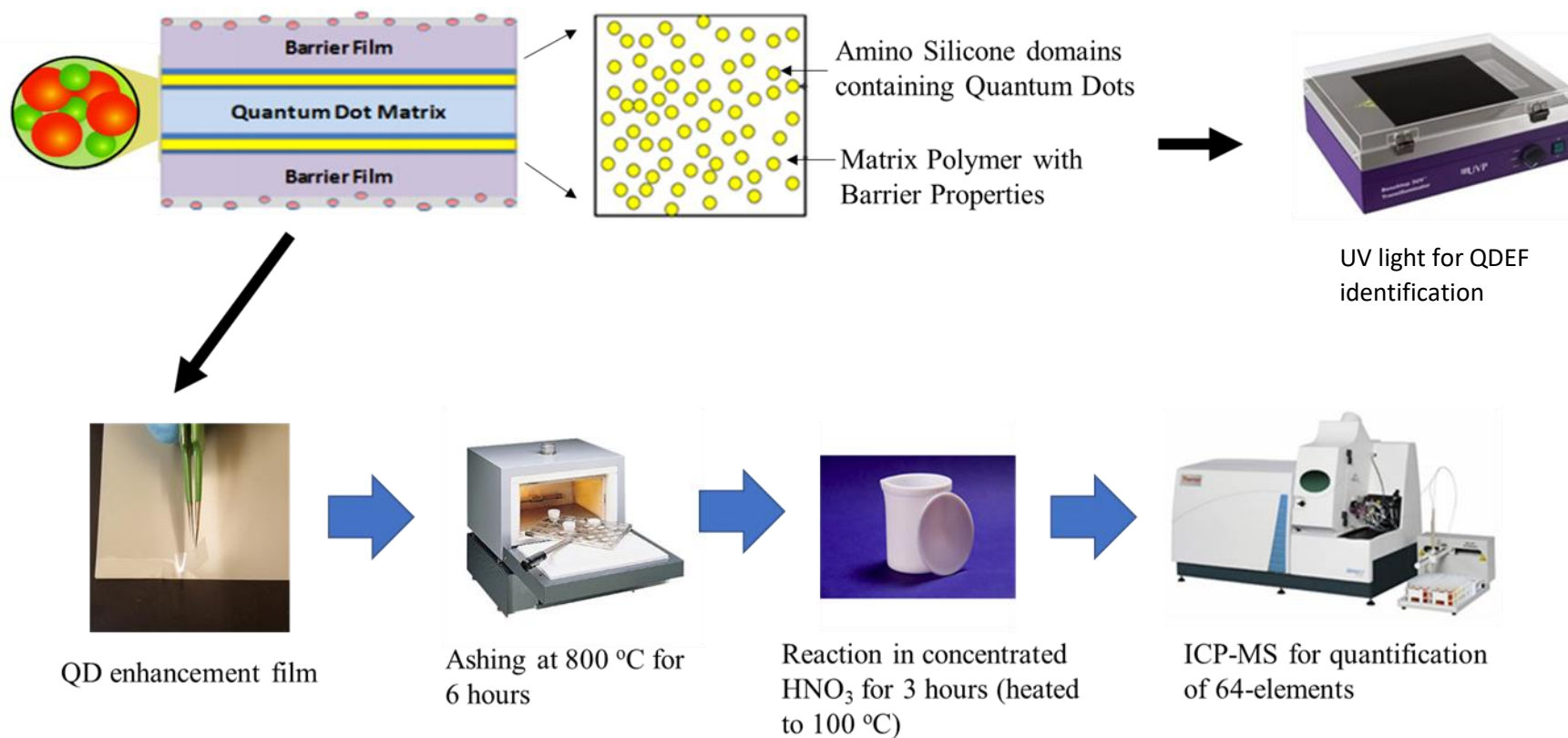


Fig. S1. Quantification for QD materials: Nitric acid digestion followed by ICP-MS

Table S1 TCLP test for 2011 Kindle Fire Tablet with CdSe QD-enabled display

	Sample mass (g)	Leachant (g)	L/S ratio (g/g)	QD layer mass (g)	Initial Cd total (ug)	111Cd (ppb)	leached Cd mass (ug)	leached Cd (%)	Initial Zn total (ug)	68Zn (ppb)	leached Zn mass (ug)	leached Zn (%)
QD film_1	1.36	27.23	20.02	0.550	172.98	0.546	0.015	0.009	245.15	554.4	15.096	6.158
QD film_2	1.36	27.24	20.03	0.550	172.98	2.274	0.062	0.036	245.15	126.4	3.443	1.404
QD film_3	1.37	27.43	20.02	0.554	174.25	1.212	0.033	0.019	246.95	300	8.229	3.332
QD film_blank	0	27.29	\	n/a	n/a	0.009	0.000		n/a	0	0.000	
QD display_1	33.6	671.71	19.99	n/a	n/a	0.11	0.074		n/a	1517	1018.984	
QD display_2	33.83	676.19	19.99	n/a	n/a	0.058	0.039		n/a	456.3	308.545	
QD display_3	34.82	696.62	20.01	n/a	n/a	0.068	0.047		n/a	1330	926.505	
QD display_blank	0	682.61	\	n/a	n/a	0.009	0.006		n/a	2.428	1.657	
Average								0.021				3.632
Error								0.014				2.391

Table S2 TCLP test for 2016 Samsung TV set with InP QD-enabled display

	Sample mass (g)	Leachant (g)	L/S ratio (g/g)	QD layer mass (g)	Initial In total (ug)	113In (ppb)	leached In mass (ug)	leached In (%)	Initial Zn total (ug)	68Zn (ppb)	leached Zn mass (ug)	leached Zn (%)
QD film_1	2.359	48.07	20.38	2.359	166.37	0.097	0.005	0.003	10228.96	762.4	36.649	0.358
QD film_2	2.445	48.943	20.02	2.445	172.43	0.029	0.001	0.001	10601.86	732.5	35.851	0.338
QD film_3	2.51	50.649	20.18	2.510	177.02	0.105	0.005	0.003	10883.71	685.3	34.710	0.319
QD film_blank	0	50.76	\	n/a	n/a	0.055	0.003	n/a	n/a	0.924	0.047	n/a
Average								0.002				0.338
Error								0.001				0.020

Table S3 ICP digestion for 2011 Kindle Fire Tablet with CdSe QD-enabled display

	Crucible (g)	Crucible + PP (g)	After Ashing (g)	ICP tube (g)	Tube + digestant (g)	Dilution factor	¹¹¹ Cd (ppb)	Corrected Cd (ppb)	Cd mass (ug)	Cd loading (ug/g)	Cd loading (ug/cm ²)	⁶⁸ Zn (ppb)	Corrected Zn (ppb)	Zn mass (ug)	Zn loading (ug/g)	Zn loading (ug/cm ²)
Layer # rep 1	14.4058	14.7173	14.417	6.5943	14.3999	10	1244	12440	97.102	311.723	2.280	1756	17560	137.066	440.020	3.218
Layer # rep 2	11.1248	11.4441	11.1362	6.533	12.8615	20	767.6	15352	97.155	304.275	2.225	1106	22120	139.986	438.417	3.207
Layer # rep 3	15.635	16.0017	15.648	6.581	13.8781	10	1645	16450	120.037	327.345	2.394	2304	23040	168.125	458.482	3.353
Barrier layer	15.255	15.4519	15.2546	6.677	13.7673	10	0.019	0.19	0.001	0.007	0.000	5.113	51.13	0.363	1.841	0.010
Average										314.448	2.300				445.639	3.259
Error										11.774	0.086				11.150	0.082

Table S4 ICP digestion for 2016 Samsung TV set with InP QD-enabled display

	Crucible (g)	Crucible + PP (g)	After Ashing (g)	ICP tube (g)	Tube + digestant (g)	Dilution factor	113In (ppb)	Corrected In (ppb)	In mass (ug)	In loading (ug/g)	In loading (ug/cm ²)	68Zn (ppb)	Corrected Zn (ppb)	Zn mass (ug)	Zn loading (ug/g)	Zn loading (ug/cm ²)	31P (ppb)	Corrected P (ppb)	P mass (ug)	P loading (ug/g)	P loading (ug/cm ²)
Layer # rep 1	15.624 5	16.760 5	15.64 24	6.49 99	16.976 5	10	76.6	7660	80.2 51	70.64 3	2.809	47330	473300	4958.5 75	4364.9 43	173.56 2	2535	25350	265.5 82	233.7 87	9.296
Layer # rep 2	10.844 8	12.111 4	10.86 51	6.51 9	17.138 6	10	80.06	8006	85.0 21	67.12 5	2.669	52400	524000	5564.6 70	4393.3 92	174.69 3	2832	28320	300.7 47	237.4 44	9.441
Layer # rep 3	13.348 1	14.497 6	13.36 69	6.59 65	18.008 5	10	74.34	7434	84.8 37	73.80 3	2.935	42810	428100	4885.4 77	4250.0 89	168.99 5	2358	23580	269.0 95	234.0 97	9.308
Blank	14.615 9	14.615 9	14.61 59	6.69 1	17.816 4	10	0.026	0.26	0.00 3	n/a	n/a	9.187	91.87	1.022	n/a	n/a	0	0	0.000	n/a	n/a
Average										70.52 4	2.804				4336.1 41	172.41 7				235.1 10	9.349
Error										3.341	0.133				75.869	3.017				2.028	0.081

Given the mass constraints of QD material available for testing, the SW-846 Method 1311 was adapted to accommodate the amounts of waste materials but kept the mass to volume ratio constant.