Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information

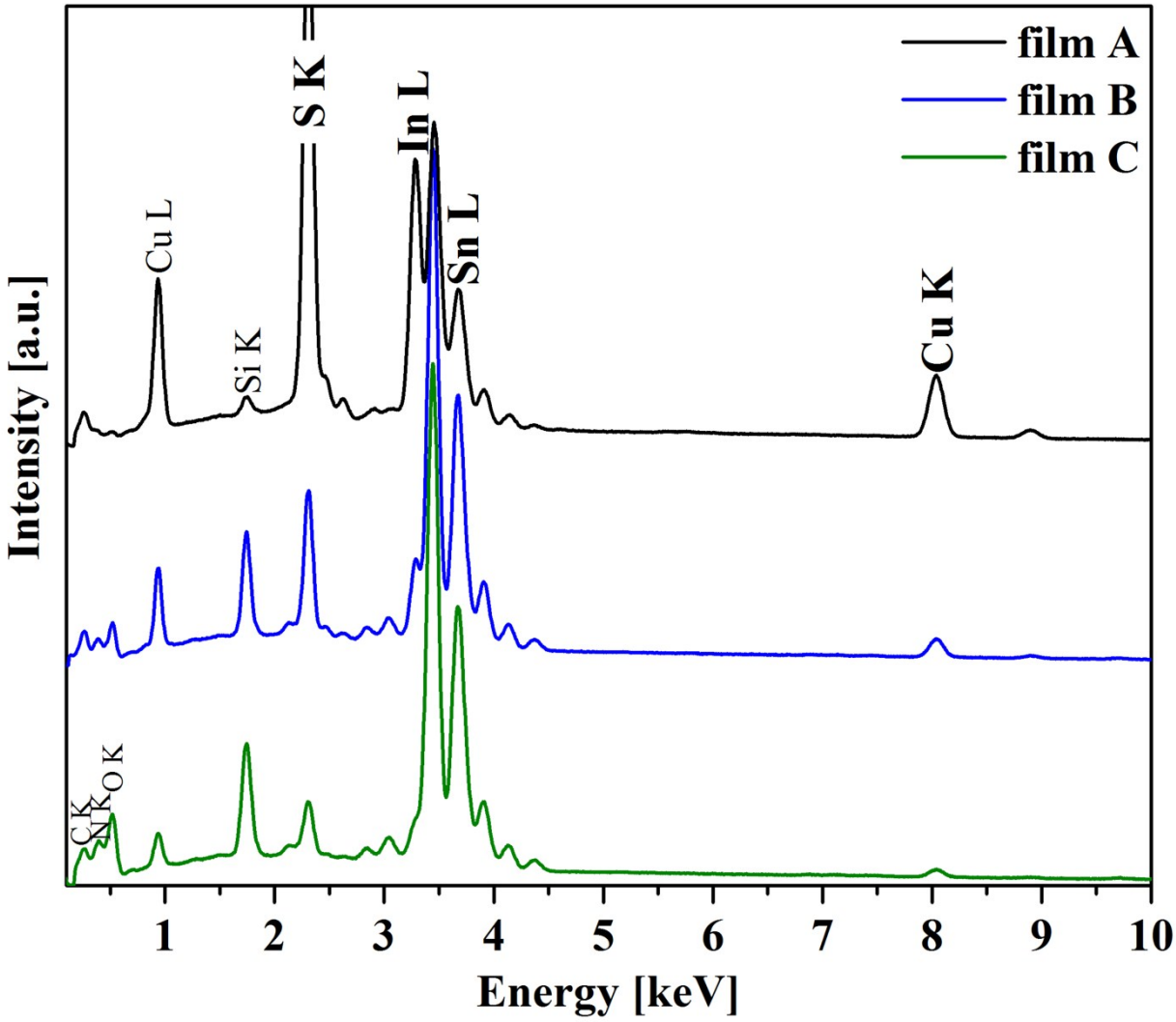
Supplementary Table 1. Summarized literature data that were used for the analysis of XRD and electron diffraction data listed for the region of the XRD analysis (20-100° 2θ). Not all possible values are included, e.g. for all the compounds close d-values are summarized. For L-cystine a large number of d-spacings occur, which are very close to each other and are presented here by an average value.

$CuInS_2$	tetragonal	ICSD 189077[1]	**2θ [deg]**	20.83	32.49	37.78	54.31	64.90	80.70	89.41										
			d [Å]	4.95	3.20	2.76	1.96	1.67	1.38	1.27										
			hkl	101	112	200 004	204 220	312 116	400	316 332										
$CuInS_2$	hexagonal	ICSD 163489[2]	**2θ [deg]**	30.66	32.31	34.77	45.14	54.51	59.22	64.81	66.29	73.39	84.70	91.00	92.23	96.18				
			d [Å]	3.38	3.21	2.99	2.33	1.95	1.81	1.67	1.64	1.50	1.33	1.25	1.24	1.20				
			hkl	100	002	101	102	110	103	112 200	201	202	203	211	114	105 212				
Cu_2S	tetragonal	ICSD 16550[3]	**2θ [deg]**	27.47	31.84	36.91	38.09	45.67	46.64	53.23	54.08	56.71	60.91	63.34	67.30	73.48	79.34	84.50	90.84	93.00	96.69
			d [Å]	3.77	3.26	2.83	2.74	2.31	2.26	2.00	1.97	1.88	1.76	1.70	1.61	1.50	1.40	1.33	1.26	1.23	1.20
			hkl	101	102	110 004	111 103	104	113	114 200	201 105	202	203	212 106	213	107	215 221	108 223	311 224	312	217
Cu_2S	hexagonal	ICSD 159437[4]	**2θ [deg]**	30.32	30.74	43.72	53.86	56.83	63.06	64.02	71.79	82.13	96.25								
			d [Å]	3.42	3.38	2.40	1.98	1.88	1.71	1.69	1.53	1.36	1.20								
			hkl	100	002	102	110	103	200 112	004	202	203	204 112								

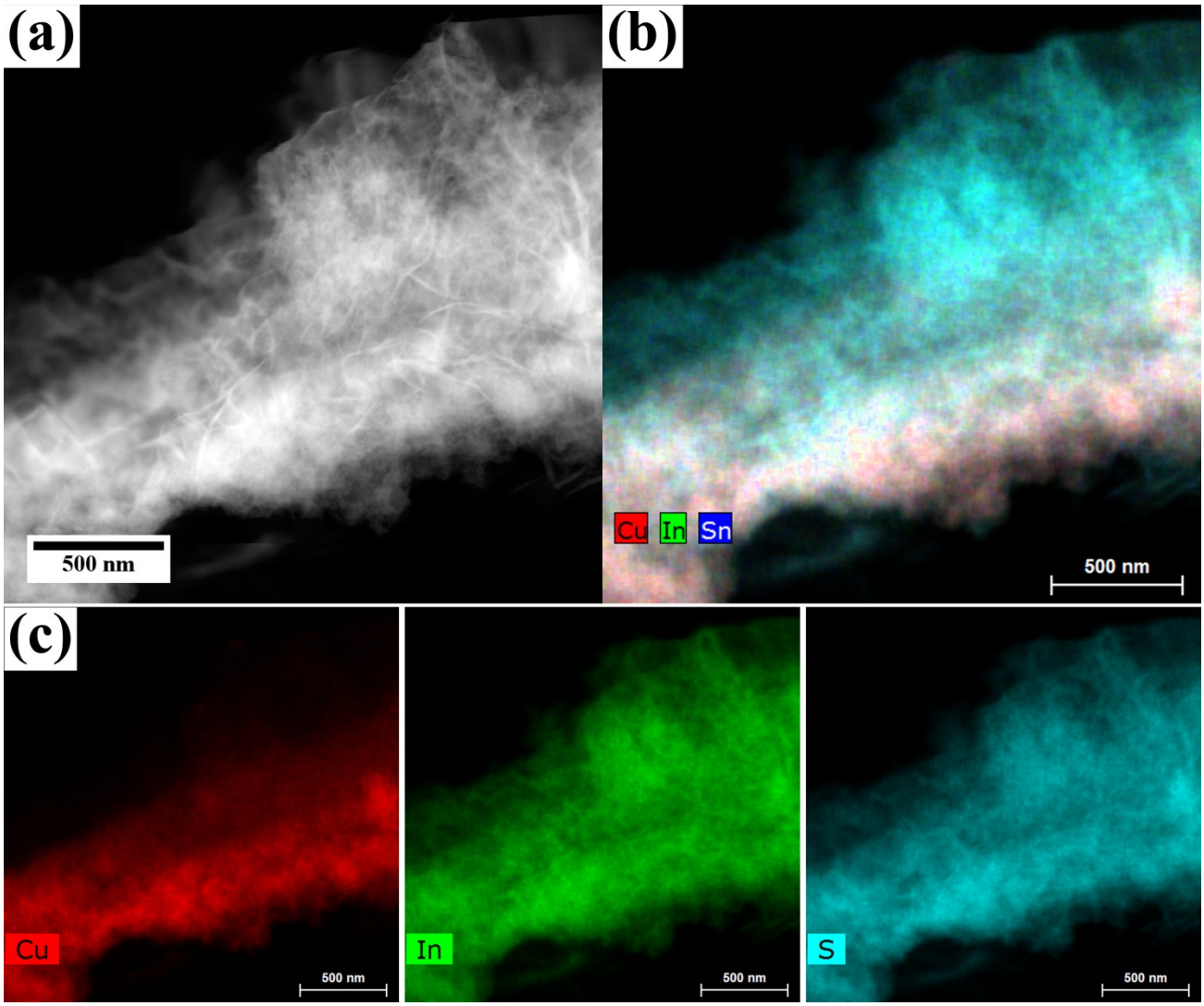
In_2S_3	tetragonal	ICSD 183879[5]	**2θ [deg]**	20.15	20.89	25.55	26.16	27.16	27.91	30.61	31.95	33.41	38.06	38.78	42.40	47.95	51.10	55.98	58.80	63.33	76.77
			d [Å]	5.11	4.93	4.05	3.95	3.81	3.71	3.39	3.25	3.11	2.74	2.69	2.47	2.20	2.07	1.91	1.82	1.70	1.44
			hkl	112	105	008	107	200 116	202	211	213 109	206	217	220	219 303	2 0 12 316	323 1 0 15	2 2 12 400	329 2 1 15	420	4 2 12
L-cystine	hexagonal	COD ID1513328[6]	**2θ [deg]**	21.97	22.05	23.19	24.63	25.53	31.37	33.43	34.18	38.55	38.73	38.97	40.37	44.97	45.91	49.35	52.45	54.64	70.96
			d [Å]	4.69	4.68	4.45	4.19	4.05	3.31	3.11	3.04	2.71	2.70	2.68	2.59	2.34	2.29	2.14	2.02	1.95	1.54
			hkl	010 −110	011 −111	014 −114	016 −116	017 −117	0 1 12 −1 1 12	0 0 −18	0 1 14 −1 1 14	−120 112	−122 112	−123	0 1 18 −1 1 18	022 −222	−1 2 13	−1 2 16 1 1 16	0 2 14 −2 2 14	0 2 16 −2 2 16	−1 3 18 −2 3 18
SnO_2	tetragonal	ICSD 647469[7]	**2θ [deg]**	30.97	39.54	44.37	45.58	49.94	60.92	64.55	68.29	73.31	76.86	78.41	85.14	94.83	98.07				
			d [Å]	3.35	2.64	2.37	2.31	2.12	1.76	1.68	1.59	1.50	1.44	1.42	1.32	1.21	1.18				
			hkl	110	101	200	111	210	211	220	002	310	112	301	202	321	400				
CuS	hexagonal	ICSD 63327[8]	**2θ [deg]**	31.61	32.26	34.14	37.09	38.35	45.43	50.51	51.94	56.30	62.09	67.52	70.18	80.14	82.73	88.69	93.60	95.32	
			d [Å]	3.28	3.22	3.05	2.81	2.72	2.32	2.10	2.04	1.90	1.73	1.61	1.56	1.39	1.35	1.28	1.23	1.21	
			hkl	100	101	102	103	006	105	106	008	110 107	108	202	116 203	118	1 0 11	208	212	213	

Supplementary Table 2. SEM EDX quantifications results of films A, B and C.

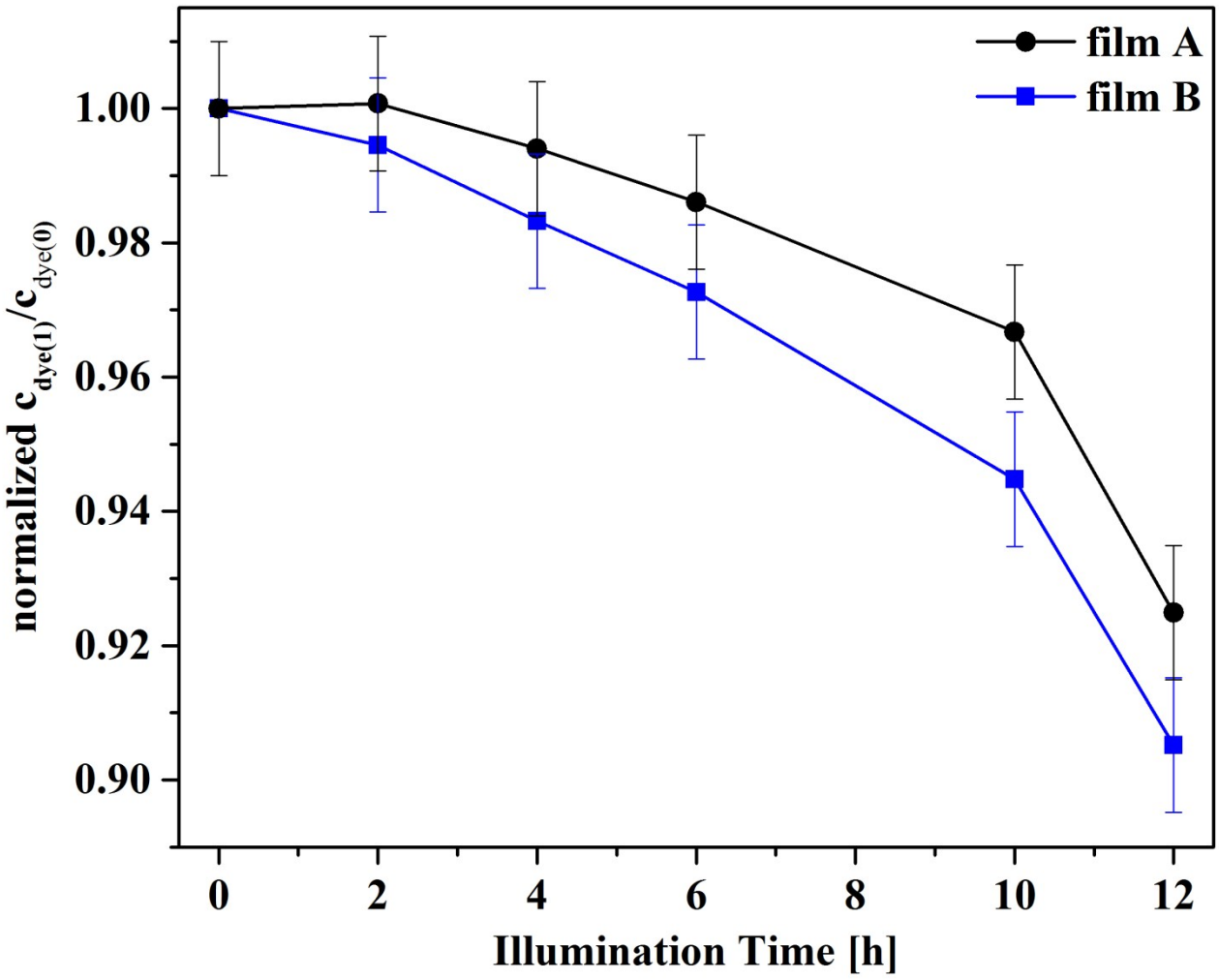
	Cu	In	S
film A [at.%]	24 ± 4	23 ± 2	53 ± 7
normalized	1.0	1.0	2.2
film B	20 ± 1	28 ± 2	51 ± 1
normalized	1.0	1.4	2.5
film C	20 ± 5	28 ± 4	51 ± 11
normalized	1.0	1.4	2.5



Supplementary Figure 1. EDX spectra of films A, B and C obtained in the SEM at 20 kV acceleration voltage. Sn, Si and O signals stem from the FTO coated glass substrate.



Supplementary Figure 2. (a) STEM HAADF image of a nearly cross sectional part of the scratch sample of film A. (b) according EDX map overlay of Cu, In and S signal. (c) Single Cu, In and S EDX maps of the same area.



Supplementary Figure 3 First dye degradation results of films A (black) and B (blue) under solar illumination. The used dye is rhodamine B.

References

1. C. H. Ho, C. C. Pan, J. R. Cai, G. T. Huang, D. O. Dumcenco, Y. S. Huang, K. K. Tiong and C. C. Wu, *Solid State Phenomena*, 2013, **194**, 133-138.
2. Y. Qi, Q. Liu, K. Tang, Z. Liang, Z. Ren and X. Liu, *The Journal of Physical Chemistry C*, 2009, **113**, 3939-3944.
3. A. Janosi, *Acta Crystallographica*, 1964, **17**, 311-312.
4. P. Lukashev, W. R. L. Lambrecht, T. Kotani and M. van Schilfgaarde, *Physical Review B*, 2007, **76**, 195202.
5. A. Lafond, X. Rocquefelte, M. Paris, C. Guillot-Deudon and V. Jouenne, *Chemistry of Materials*, 2011, **23**, 5168-5176.
6. S. A. Moggach, D. R. Allan, S. Parsons, L. Sawyer and J. E. Warren, *Journal of Synchrotron Radiation*, 2005, **12**, 598-607.
7. G. J. McCarthy and J. M. Welton, *Powder Diffraction*, 1989, **4**, 156-159.
8. H. Fjellvag, F. Gronvold, S. Stolen, A. F. Andresen, R. Mueller Kaefer and A. Simon, *Zeitschrift für Kristallographie*, 1988, **184**, 111-121.