Electronic Supplementary Material (ESI) for Materials Advances.

Supplementary Information

Fast response, multi-color photodetection in p-type Cu doped CdS thin films

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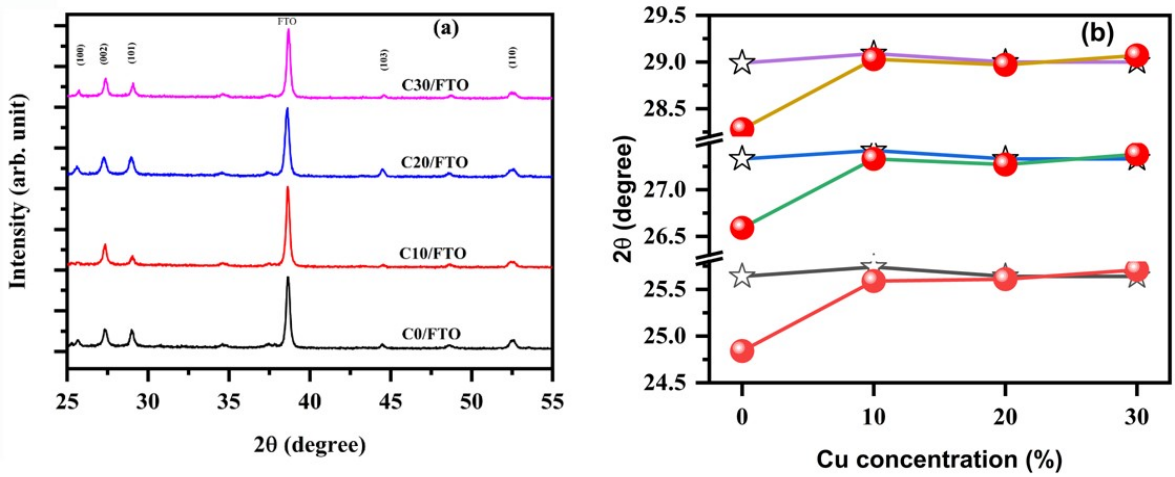

Fig.S1: a) XRD of CuCdS samples on FTO b) comparison of peak shifts between CuCdS samples on glass (star) and FTO (sphere)

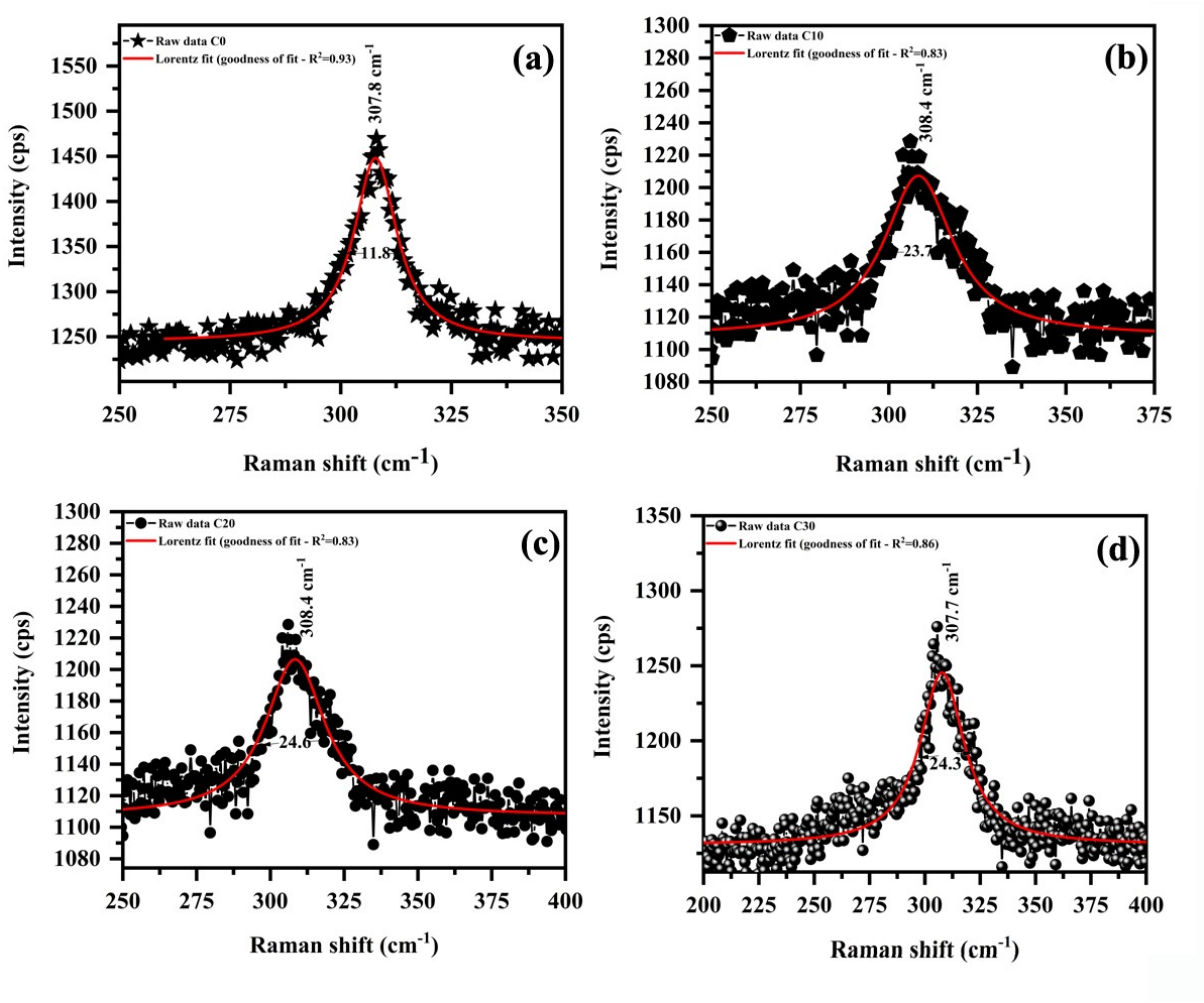

Fig.S2: Raman line fitting using Lorentzian function for CuCdS thin films with a) 0 at. % b) 10 at. % c) 20 at. % d) 30 at. % of Cu concentration

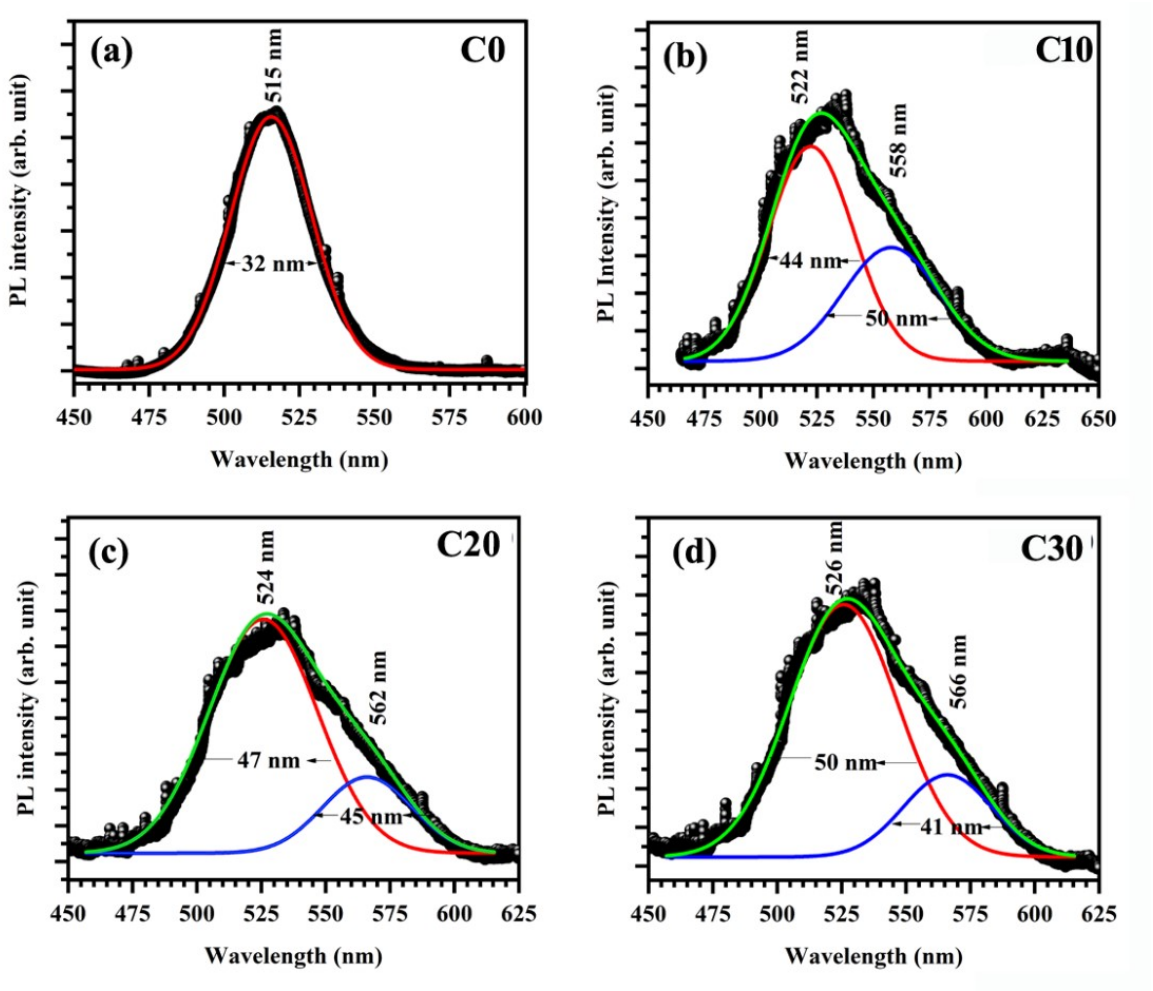

Fig.S3: Photoluminescence curve fitting using Gaussian function for CuCdS thin films with a) 0 at. % b) 10 at. % c) 20 at. % d) 30 at. % of Cu concentration

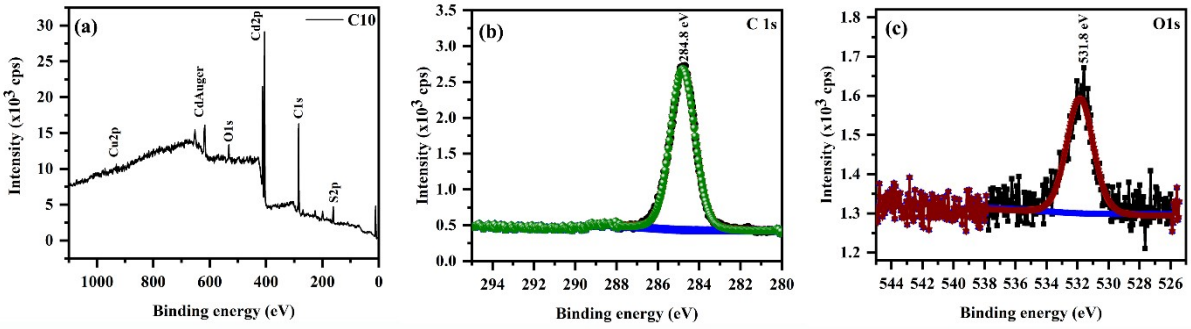

Fig.S4: a) XPS survey spectra b) C 1s curve fitting 284.8 eV c) O 1s curve fitting 531.8 eV

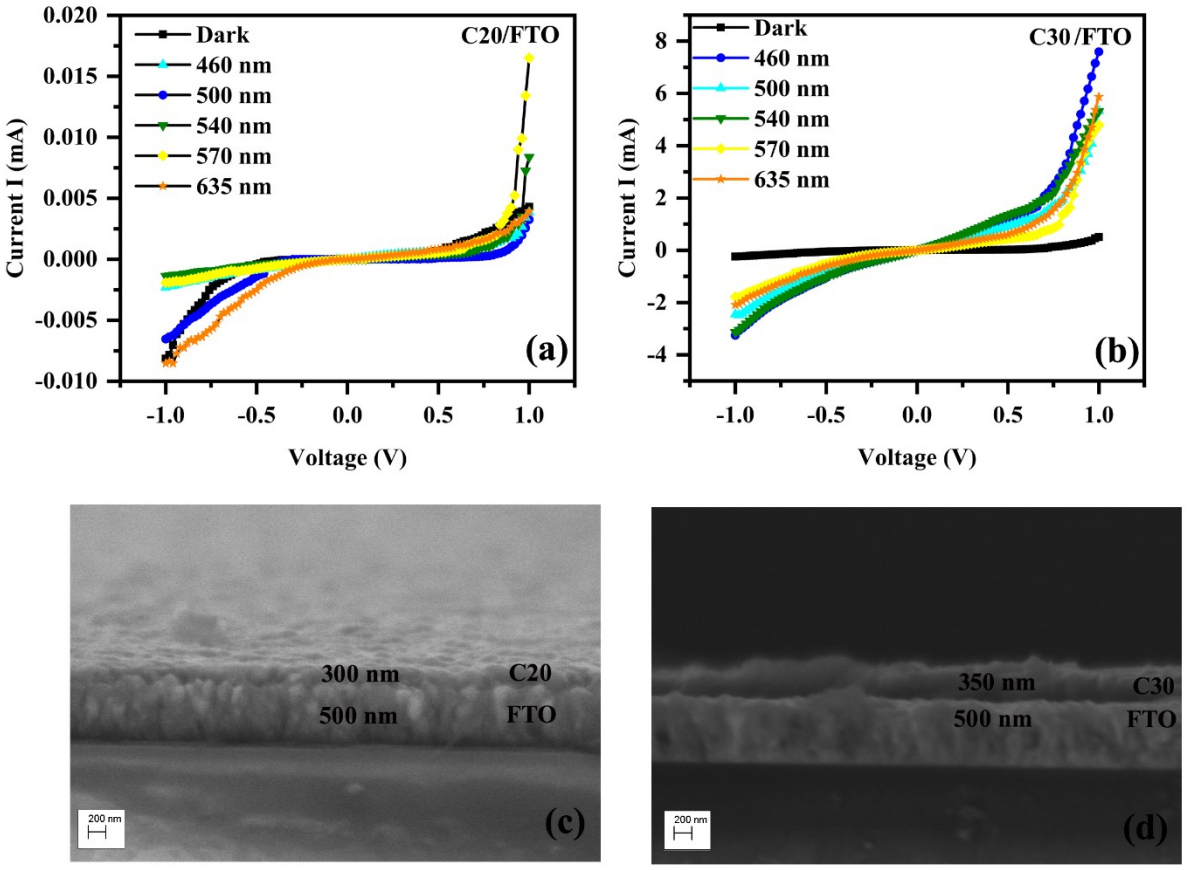

Fig.S5: I-V characteristic curves for a) C20/FTO b) C30/FTO at dark and various wavelengths c) and d) SEM cross-sectional images for C20 and C30 on FTO

Tables:

Table T1: XRD parameters extracted for CuCdS samples on FTO

Sample	Plane	2θ (degree)	FWHM (degree)	Crystallite size (nm)	Average D (nm)
C0/FTO	(100)	24.84	0.63	13.5	16.0
	(002)	26.59	0.51	16.7	
	(101)	28.28	0.48	17.8	
C10/FTO	(100)	25.59	0.52	16.3	25.5
	(002)	27.33	0.30	28.8	
	(101)	29.03	0.27	31.5	
C20/FTO	(100)	25.61	0.32	26.8	24.1
	(002)	27.27	0.38	22.4	
	(101)	28.97	0.37	23.1	

C30/FTO	(100)	25.71	0.18	47.1	37.0
	(002)	27.38	0.28	30.6	
	(101)	29.07	0.26	33.2	

Table T2: XPS parameters from peak fitting (via CASAXPS) for Cu10 sample

Element	Orbit n	j	Binding energy	FWHM	Spin orbit splitting energy	Assignment
Cd	3d	5/2	405.24	1.13	6.74	Cd-S
		3/2	411.98	1.14		
Cu	2p	1/2	949.33	4.42	19.8	Cu-S
		3/2	929.53	3.68		
S	2p	1/2	162.73	1.00	1.19	Cu-Cd-S
		3/2	161.54	0.88		
C	1s	-	284.8	1.39	-	C-O
O	1s	-	531.8	2.03	-	C-O

Table T3: Comparison of various literatures on photodetector properties with current work

Material	Wavelength (nm)	Responsivity (A/W)	Rise time (ms)	Decay time (ms)	Detectivity (jones)	Ref.
Ag:CdS	551	0.43	--	--	2.58×10^{11}	[33]
Sm:CdS	532	1.101	157	166	2.21×10^{12}	[11]
Pr:CdS	532	2.71	90	170	6.94×10^{11}	[31]
Eu:CdS	532	0.614	85	106	1.38×10^{12}	[32]
Fe:CdS	532	0.55	100	200	9.05×10^{10}	[36]
Cl:CdS	530	1.67	3200	4120	1.08×10^{9}	[21]
Y:CdS	532	0.83	78	87	4.28×10^{11}	[34]
Al:CdS	532	-	500	600	9.29×10^{11}	[38]
CdS flakes	400	0.18	14	8	2.71×10^{9}	[37]
CdS	532	0.43	200	300	8.46×10^{10}	[3]
Cu:CdS	500	0.2	11	21	1.26×10^{11}	Present work