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Supporting Information

Phase control in solution deposited tin monosulfide thin films: The role of Pb²⁺ cations

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Miller indices (hkl)	2θ (Degrees) using Cu Kα radiation	d- spacing (Å)	Normalized Intensity
221	23.03	3.865	9.09
222	26.61	3.347	100
400	30.82	2.898	98.35
401	31.79	2.812	25.76
411	32.74	2.733	18.06
431	39.60	2.274	12.74
423	41.92	2.153	5.59
440	44.15	2.049	43.07
441	44.87	2.018	11.28
433	45.58	1.988	5.12
612	50.35	1.811	9.77
504	50.35	1.811	10.67
541	51.00	1.789	6.60
622	52.29	1.748	34.08
444	54.81	1.673	9.79
632	55.43	1.656	9.06
543	56.04	1.639	5.19
544	60.21	1.536	7.44
651	63.08	1.473	5.36
810	64.77	1.438	5.56
662	70.78	1.330	7.06
814	73.44	1.288	5.09

Table S1. List of XRD peak positions obtained for π -SnS (pure powder, without addition of lead cations). See diffractogram in Figure S2, Reference 10.



Figure S2. Cross-section HRSEM images of of π -SnS thin films deposited on the GaAs (100) substrate with Pb²⁺: Sn²⁺ at. ratios of (a) 1:4, (b) 1:2, and (c) 3:4.



Figure S3. O1s and S2s core-level XPS depth profiles of the π -SnS thin films (a,d) deposited without Pb and with (b, e) 1:2 and (c, f) deposited in presence of 3:4 Pb²⁺:Sn²⁺ ion concentration in solution. Peak intensities are not normalized.



Figure S4. AFM topography and surface potential maps of (a,b) undoped and (d,e) Pb doped samples (1:2 Pb²⁺:Sn²⁺ atomic ratio in solution). The surface potential maps measured on the Pb doped sample shows a higher work-function in comparison with that measured on the undoped sample. The surface potential histograms of the (c) undoped and (f) doped samples show an average CPD of 0.470 V and 0.695 V, respectively, as obtained from the Gaussian fit (red curves).



Figure S5. Kelvin probe spectroscopy measured from a Pb doped sample (magenta) and an undoped sample (cyan) indicating a CPD of about 0.22 V between these two samples.



Figure S6. Raman spectra obtained from GaAs/SnS with 0 at. % and 10 at. % Pb^{2+} added to the deposition solution.



Figure S7. HRSEM plan-view images of SnS films deposited on glass substrates from solution containing (a) 0% at. Pb²⁺ (b) 0.1% at. Pb²⁺ (c) 1% at. Pb²⁺ and (d) 10% at. Pb²⁺. All bar scales correspond to 1 μ m.



Figure S8. HRSEM images of SnS thin films deposited onto Si (100) substrates from solution containing (a) 0% at. Pb^{2+} (b) 1% at. Pb^{2+} (c) 5% at. Pb^{2+} and (d) 10% at. Pb^{2+} . All bar scales correspond to 1 μ m.