Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supplementary Information

Application of Sn^{4+} doped In_2S_3 thin film to CIGS solar cell as a buffer layer

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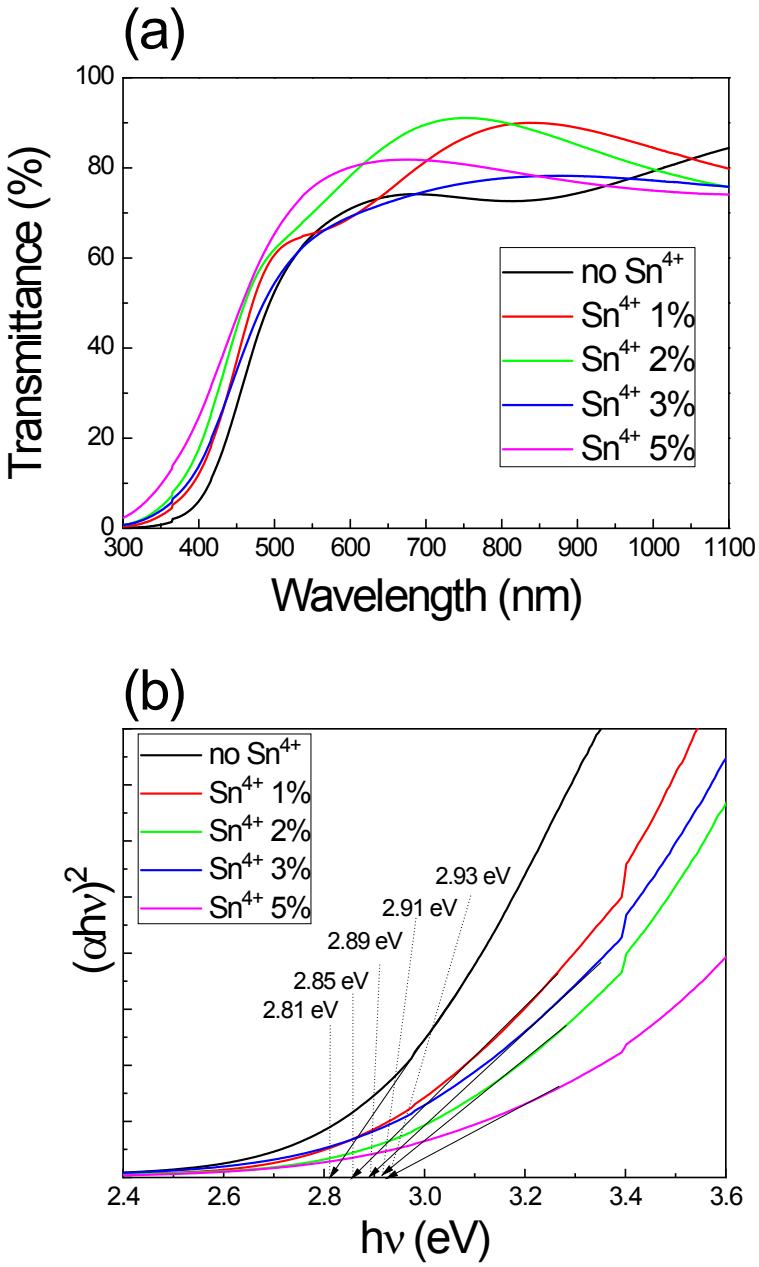

Fig. S1. (a) Transmission graph and (b) extracted band gaps for pure and Sn^{4+} doped In_2S_3 film.

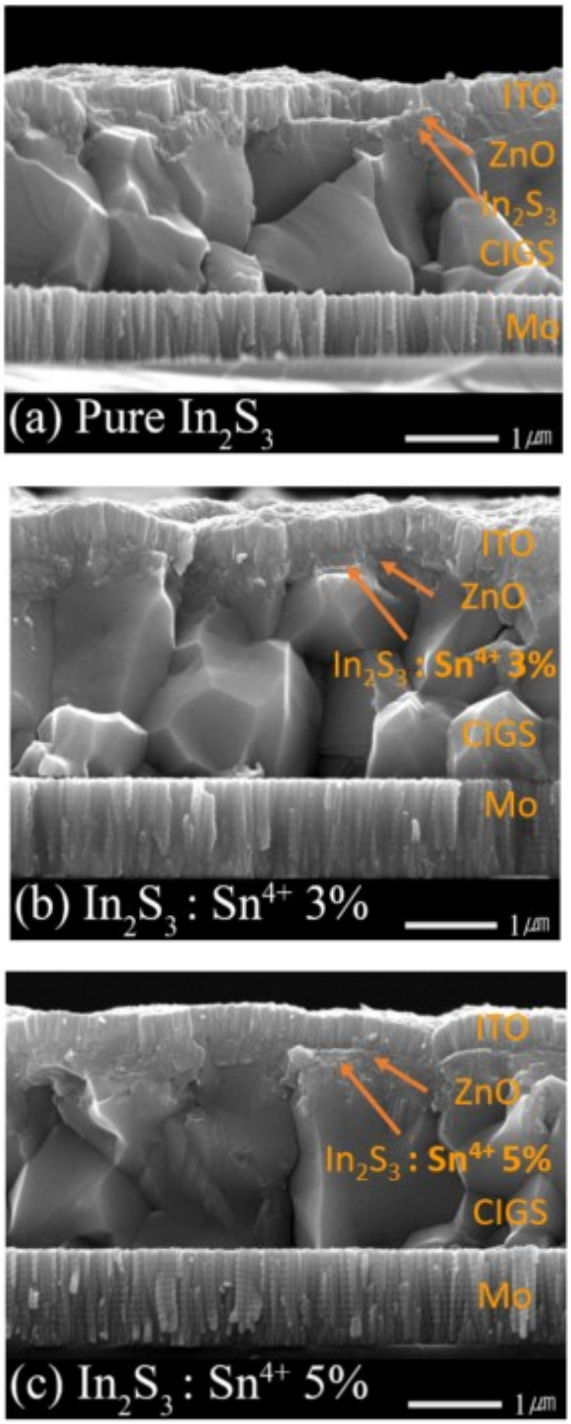

Fig. S2. Cross-sectional FE-SEM images of CIGS solar cells with (a) pure In_2S_3 buffer, (b) Sn^{4+} 3% doped In_2S_3 buffer and (c) Sn^{4+} 5% doped In_2S_3 buffer.

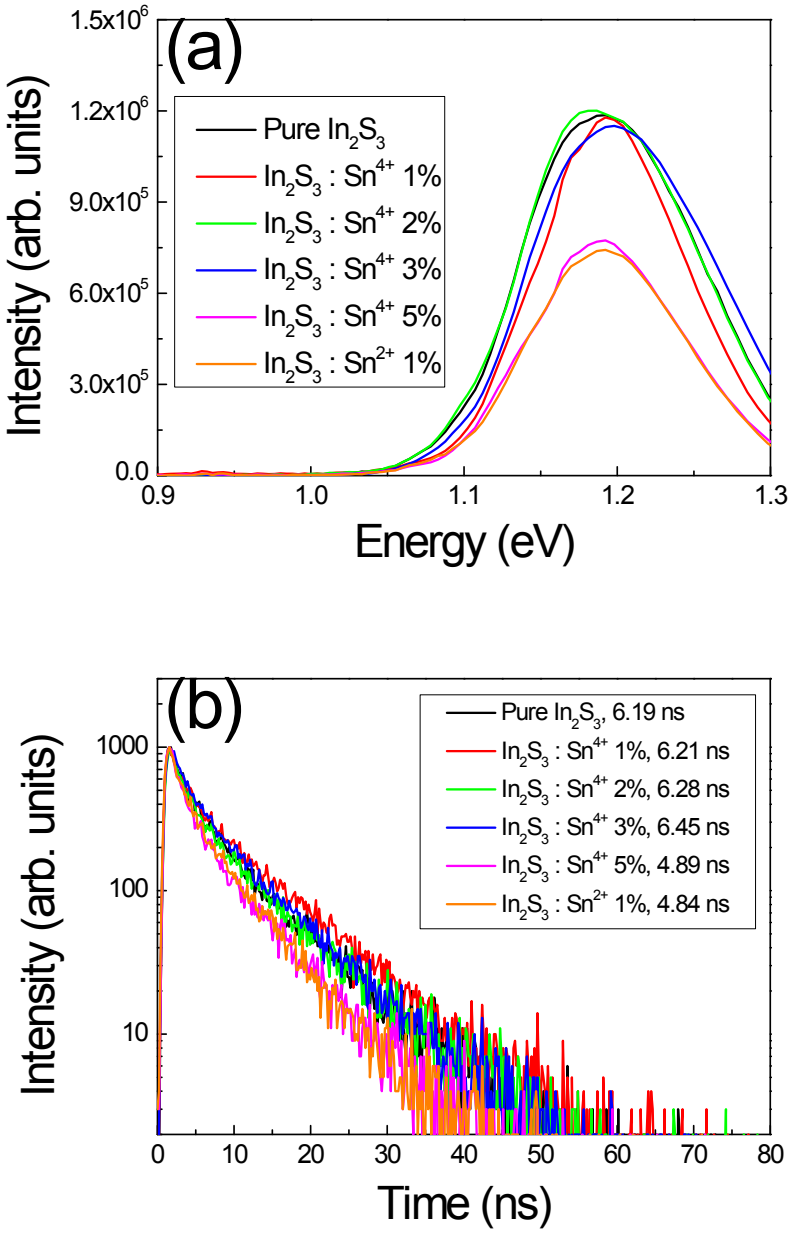

Fig. S3. (a) Steady-state PL results and (b) time-resolved PL results for CIGS solar cells with pure In_2S_3 buffer, Sn^{4+} doped In_2S_3 buffers and Sn^{2+} doped In_2S_3 buffer.

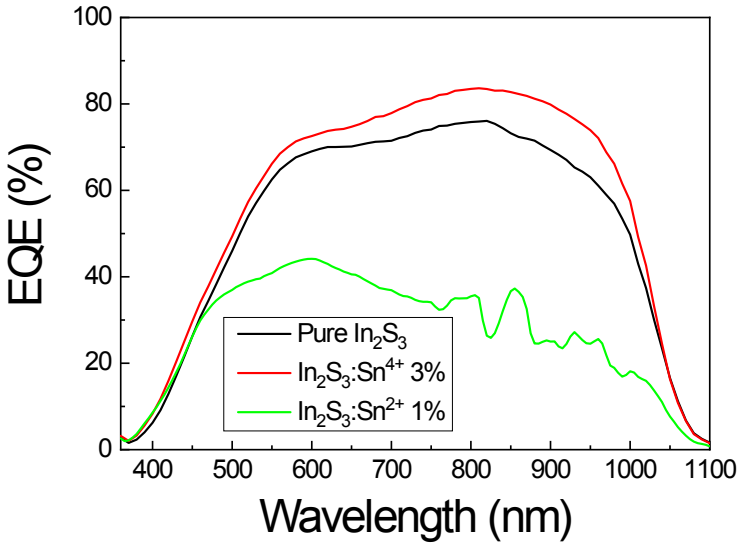

Fig. S4. EQE comparison of CIGS solar cells with pure In_2S_3 buffer, Sn^{4+} 3% doped buffer and Sn^{2+} 1% doped buffer.