Supplementary

Application of an amino acid as an efficient additive in fabrication of Sn-perovskite solar cell

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Characterization

The structural property was acquired by a FESEM, Hitachi SU8010. A UV-Vis/ NIR spectrophotometer (V-570, Jasco) recorded various absorption spectra. Photoluminescence (PL) was provided by a JASCO monochromator (CT-50TFP, F-number = 4.3, focal length = 500, and grating 600 lines mm^{-1} with a blaze at 1000 nm). The sample was excited by a Q-switched Nd-YAG laser (IB Laser, DiNY pQ532). The repetition rate of the laser was 500 Hz, and its pulse width was 532 nm. The crystal structure of perovskite film was cried out by XRD, Bruker D8-Advance, with Cu K_{α} radiation. The photovoltaic investigation was performed via a solar simulator XES-40S1, SAN-EI. A mask (0.09 cm^2) was applied in these measurements. Thermo K-ALPHA surface analysis was used for the X-ray photoelectron spectra (XPS) investigation.

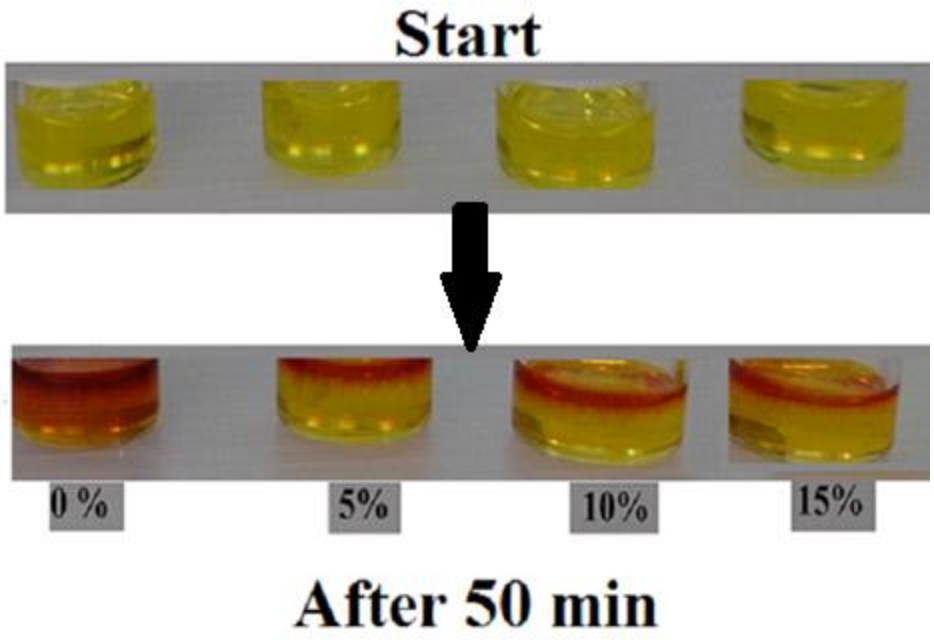

Fig. S1. Perovskite solutions with 0 (control), 5, 10, 15 % LC in the two times, starting time and after leaving in ambient with 50% Humidity for 50 min

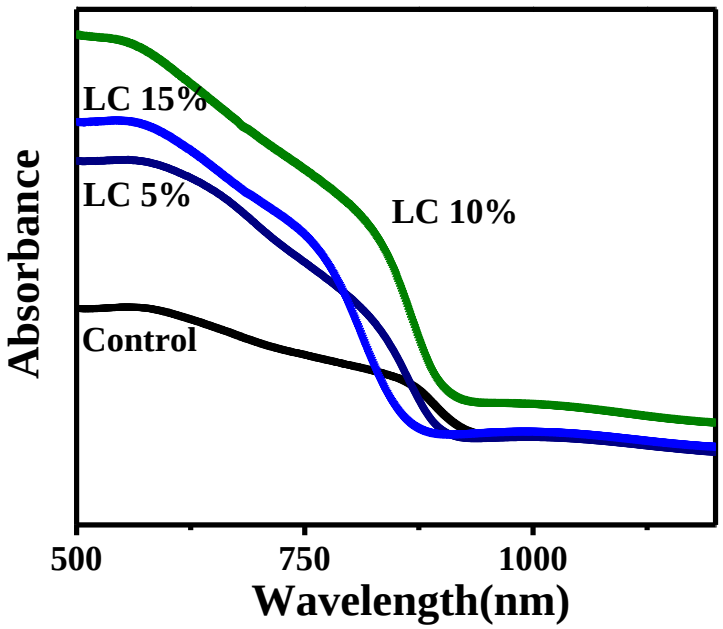

Fig. S2. UV-vis spectrum of $FASnI_3$ (control) and $FASnI_3$ with the various percent of LC

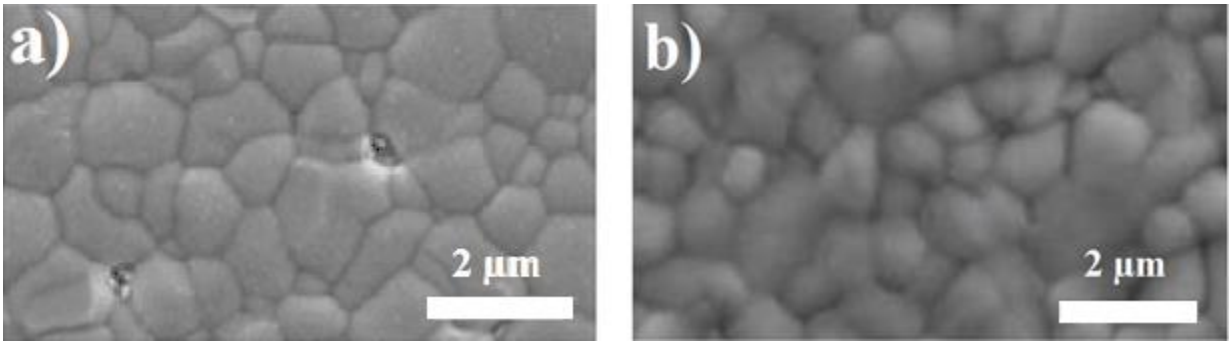

Fig. S3. SEM images of a) control film and b) LC film

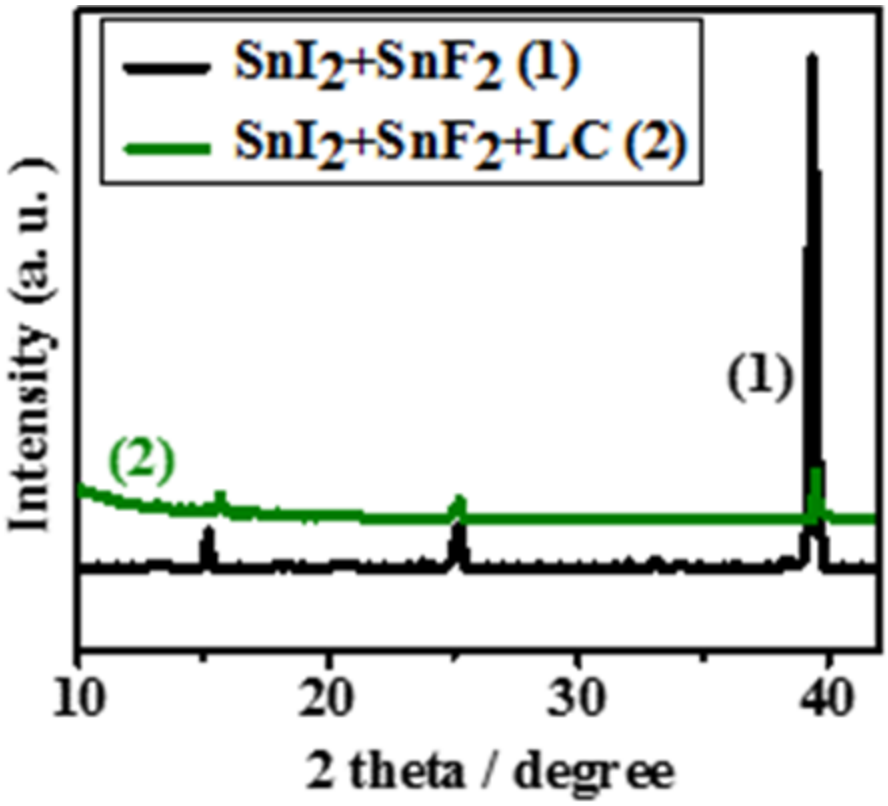

Fig. S4. The XRD patterns of (1) SnI_2+SnF_2 and (2) SnI_2 +SnF_2+LC