Supporting Information

The upsurge of absorption coefficient in $CuInS_2$ thin film with Ru doping: an energetic absorber layer in a superstrate solar cell

Logu Thirumalaisamy[a, *], Soundarrajan Palanivel[b], Karthikeyan Jeyakumar[c], Sethuraman Kunjithapatham[d, *], Trystan Watson[a], and Sudhagar Pitchaimuthu[a, e]

[a] SPECIFIC, Materials Research Centre, Faculty of Science and Engineering, Swansea University, Swansea, UK

[b] Department of Science and Humanities, Knowledge Institute of Technology (KIOT), Salem-637504, Tamil Nadu, India.

[c] Department of Sciences & Humanities, Rajiv Gandhi Institute of Petroleum Technology, Jais, Uttar Pradesh, India

[d] Department of Materials Science, Central University of Tamil Nadu, Thiruvarur, Tamil Nadu.

[e] Research Centre for Carbon Solutions, Institute of Mechanical, Process & Energy Engineering, School of Engineering & Physical Sciences, Heriot-Watt University, UK

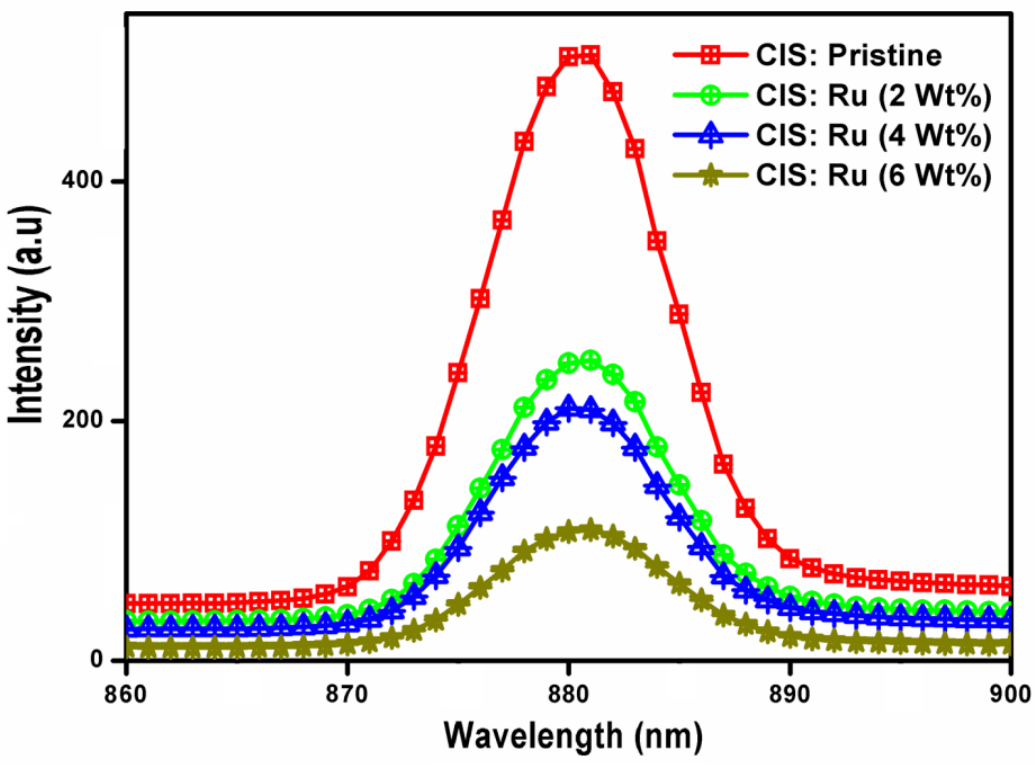


Fig. S1 Photoluminescence spectra of pristine CIS and Ru doped CIS thin films.

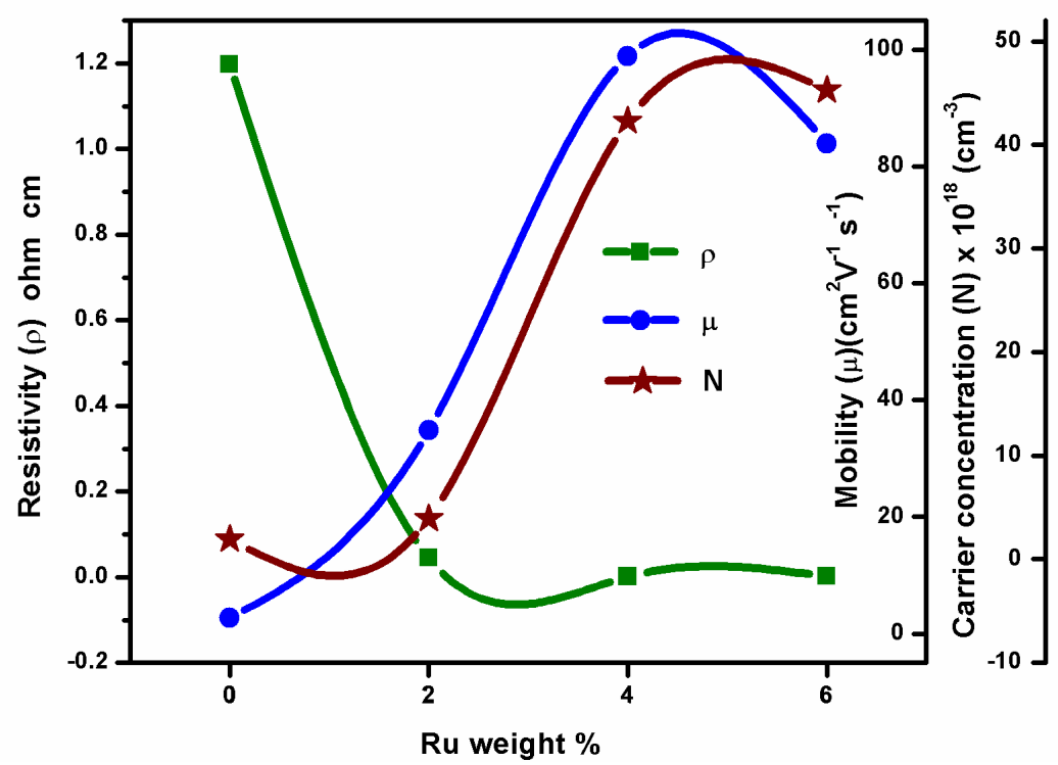
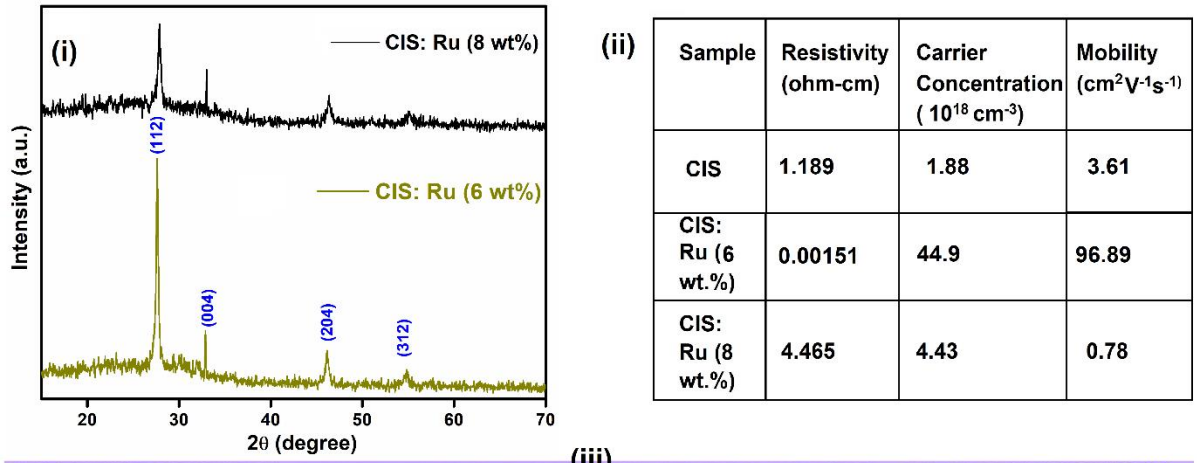


Fig. S2 The dependence of (a) resistivity, (b) conductivity, (c) carrier concentration, (d) Hall mobility of pristine and Ru-doped CIS thin films



(ii)

Sample	Resistivity (ohm-cm)	Carrier Concentration (10^{18} cm^{-3})	Mobility ($cm^2V^{-1}s^{-1}$)
CIS	1.189	1.88	3.61
CIS: Ru (6 wt.%)	0.00151	44.9	96.89
CIS: Ru (8 wt.%)	4.465	4.43	0.78

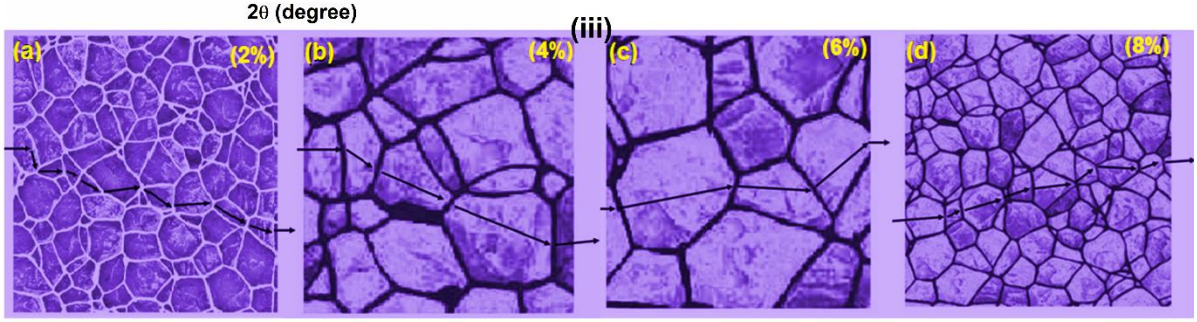


Fig S3. (i) XRD pattern, (ii) Hall measurements of undoped, 6 wt% and 8 wt% Ru doped $CuInS_2$ thin films, (iii) guide to the eye illustration of carrier movement across the grains of (2, 4, 6 and 8 wt %) Ru doped $CuInS_2$ film.

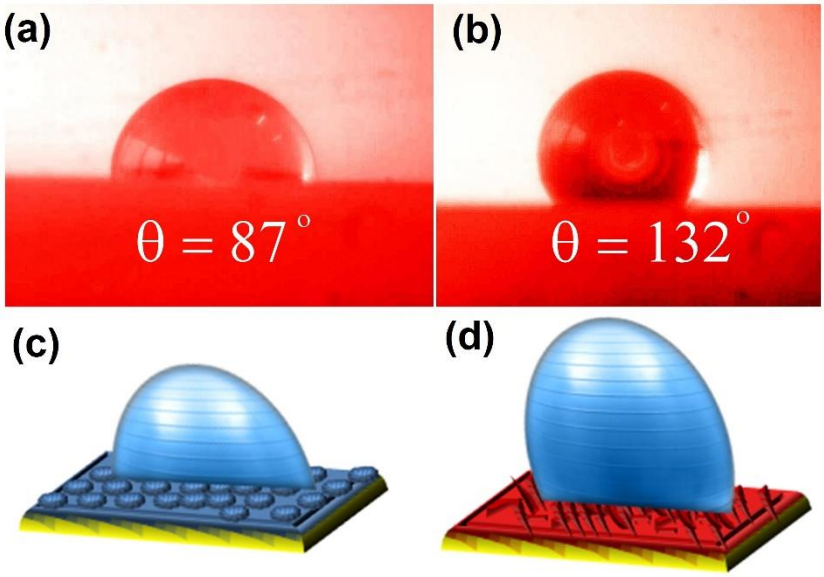


Fig. S4 The contact angle of water and schematic representation of water droplet on the surface of (a & c) pristine, and (b &d) 6 wt % of Ru-doped CIS thin film