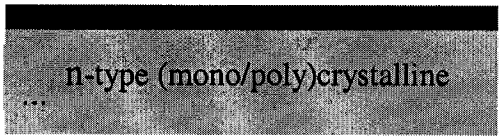
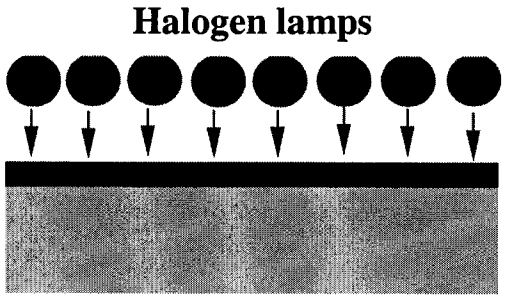
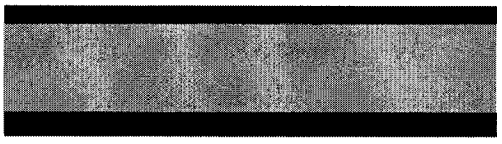
SIS solar cells : FABRICATION STEPS



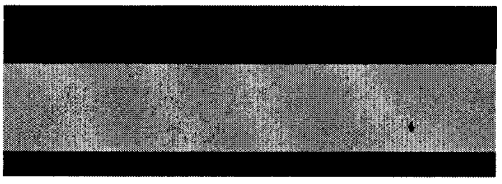
Deposition of the phosphorous containing organic film on the back side of the Si-wafer by spin-on technique



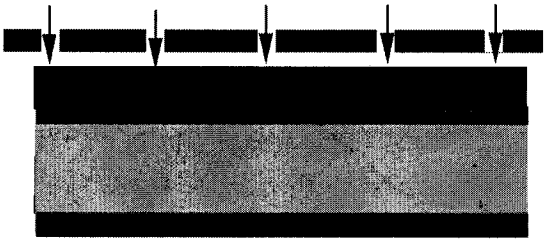
Making n^+- back side contact by rapid thermal annealing



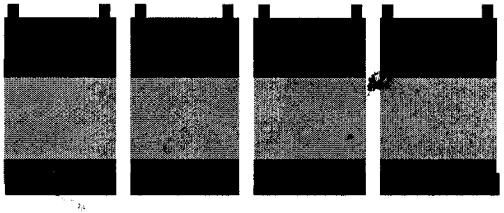
Fabrication of the tunnel oxide by chemical oxidation



Deposition of indium-tin oxide (ITO) film by spray pirolysis technique

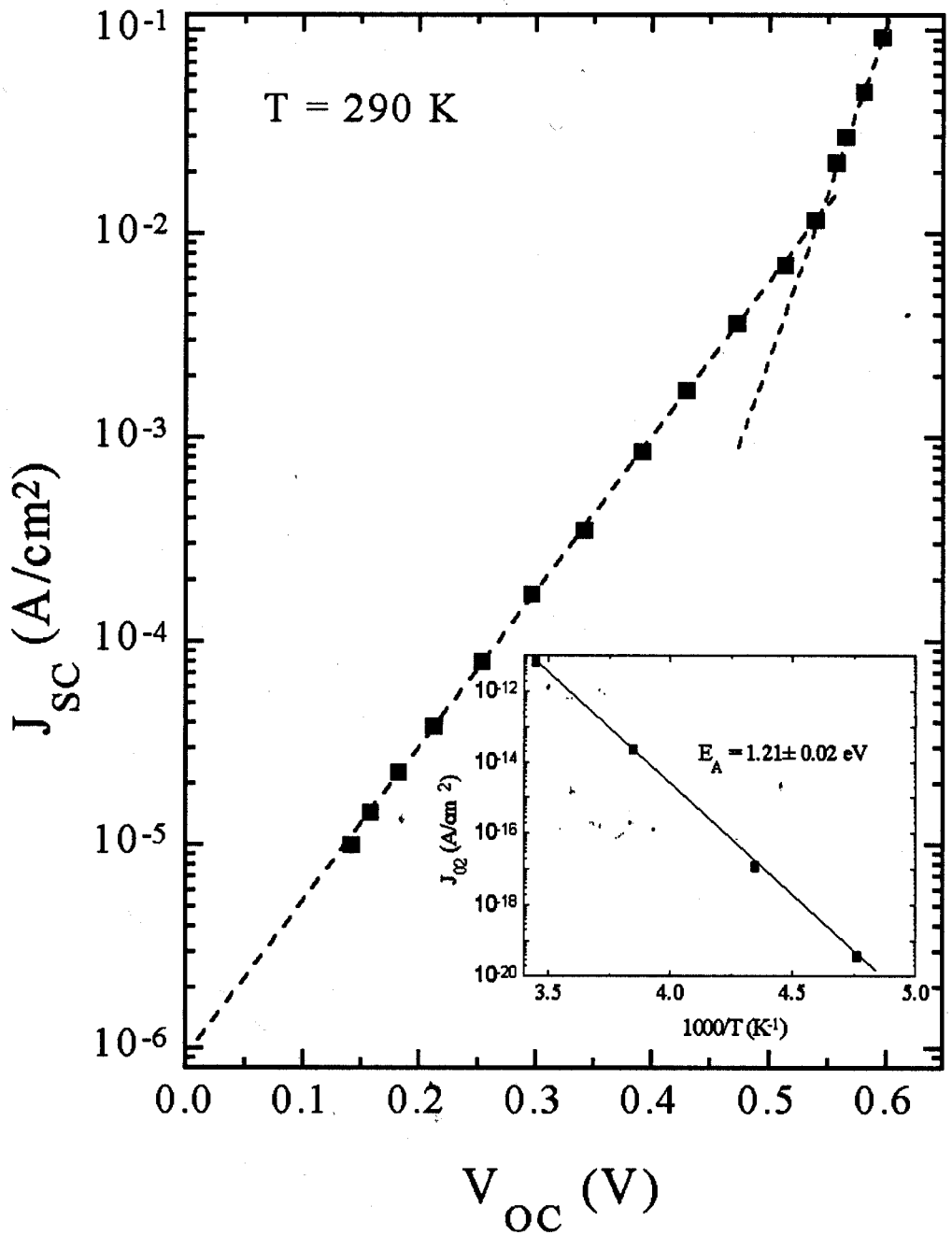


Vacuum deposition of the metallic grid



Cutting of Si-wafer on separate solar cells, soldering and assembling in solar modules

ITO/SiO_x/n-Si: forward I-V



Transparent p-Type Conducting Oxides

H. Kawazoe, H. Yanagi, K. Ueda, and H. Hosono

Table I: Preparation Conditions of Thin Films of $CuAlO_2$, $CuGaO_2$, and $SrCu_2O_2$ by Pulsed Laser Deposition.

	$CuAlO_2$	$CuGaO_2$	$SrCu_2O_2$*
Substrate	α-Al_2O_3 (0001)	α-Al_2O_3 (0001)	Silica glass
Base pressure (Pa)	1×10^{-7}	6×10^{-6}	1.0×10^{-6}
Pressure (O_2 flow) (Pa)	1.3	9	7.0×10^{-4}
KrF laser frequency (Hz)	20	20	2
Laser power (J pulse^{-1} cm^{-2})	5	6	2.5
Substrate temperature (°C)	690	700	300
Substrate–target distance (mm)	25	25	40
Post annealing (temperature × time) (°C × h)	690 × 3	None	300 × 3
Film thickness (nm)	500	500	120

*3% of Sr was replaced with K.

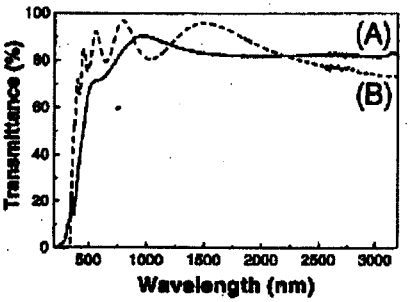


Figure 5. Optical-transmission spectra of (A) $CuAlO_2$ and (B) $CuGaO_2$ delafossite thin films in the UV–visible–near-infrared region.

Table II: Electrical Transport Properties of Thin Films of $CuAlO_2$, $CuGaO_2$, $SrCu_2O_2$, and $AgInO_2$ at Room Temperature.

	$CuAlO_2$	$CuGaO_2$	$SrCu_2O_2$*	$AgInO_2$†
Electrical conductivity (S cm^{-1})	9.5×10^{-1}	6.3×10^{-2}	4.83×10^{-2}	6×10^{0}
Carrier density (cm^{-3})	1.3×10^{17}	1.7×10^{18}	6.1×10^{17}	2.7×10^{19}
Hall mobility (cm^2 V^{-1} s^{-1})	10.4	0.23	0.46	0.47
Hall coefficients (cm^3 C^{-1})	+48.6	+3.7	+12	−0.23
Seebeck coefficients (μV K^{-1})	+183	+560	+260	−50

*3% of Sr was replaced with K.
†5% of In was replaced with Sn.

P-Type TCO

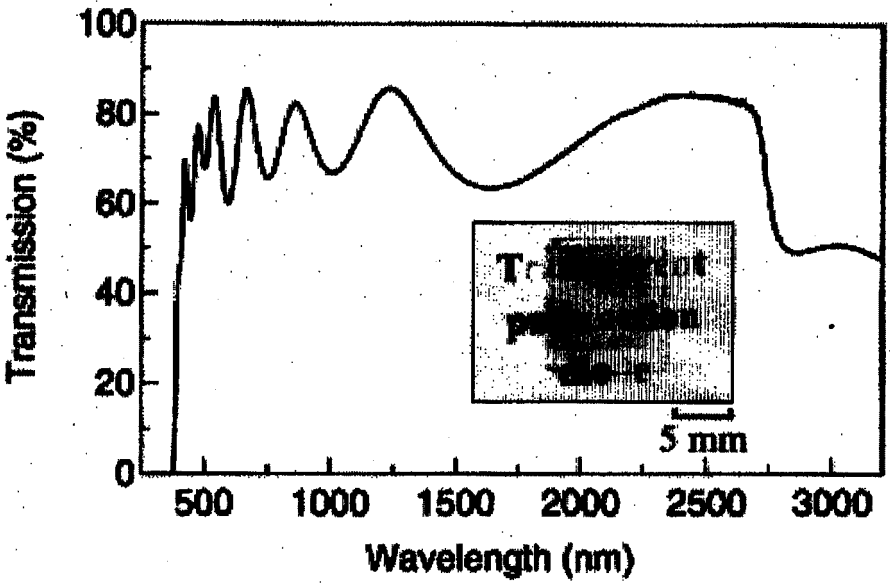


Figure 12. The optical-transmission spectrum and (inset) a photograph of a junction fabricated from p-$SrCu_2O_2$ and n-ZnO on a glass substrate.

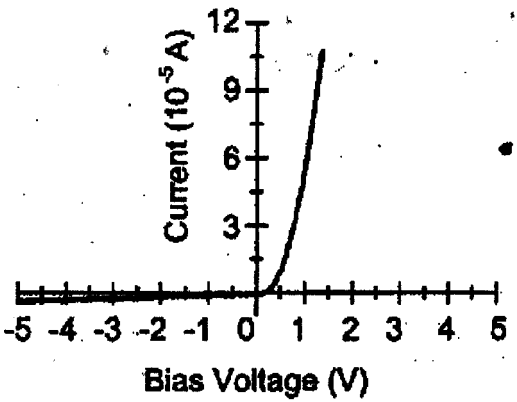


Figure 13. A typical I-V characteristic of transparent p-n heterojunctions. The junction exhibited nonlinear and rectifying I-V characteristics. The average turn-on voltage was around 0.3 V.

p-Type TCO

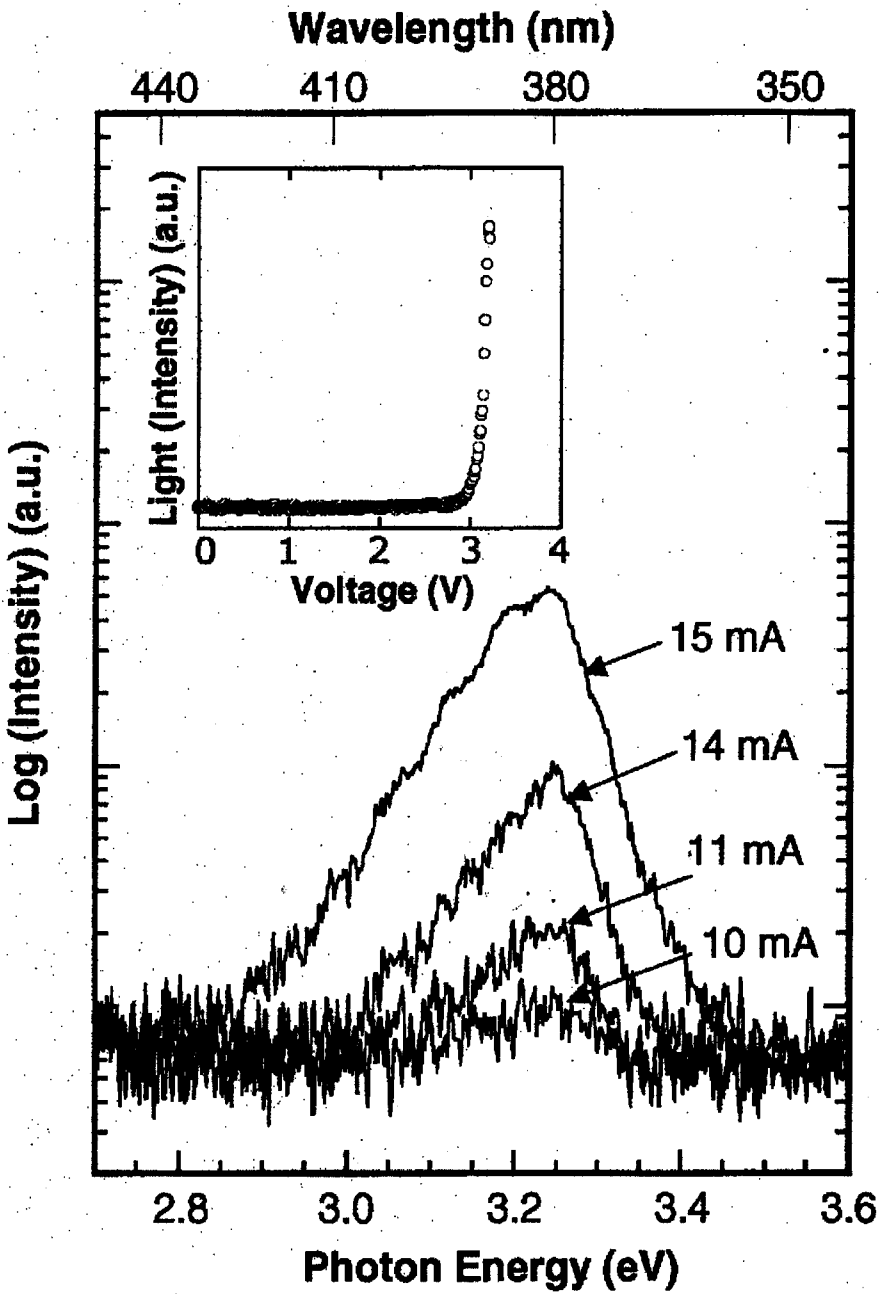
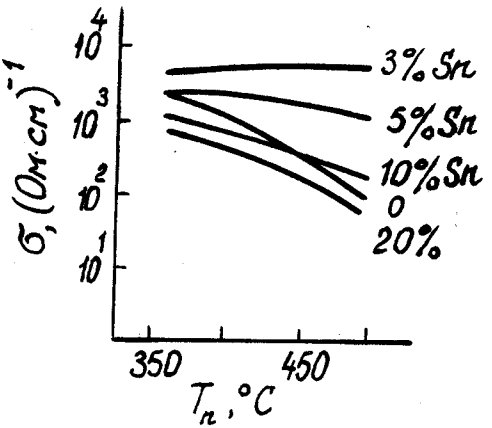
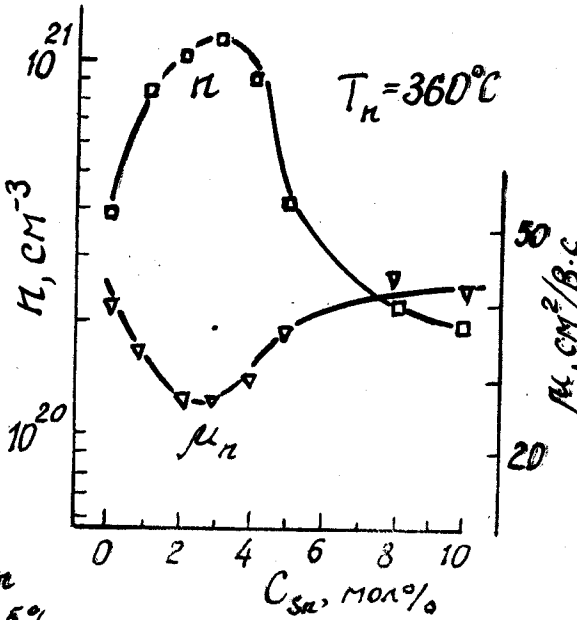
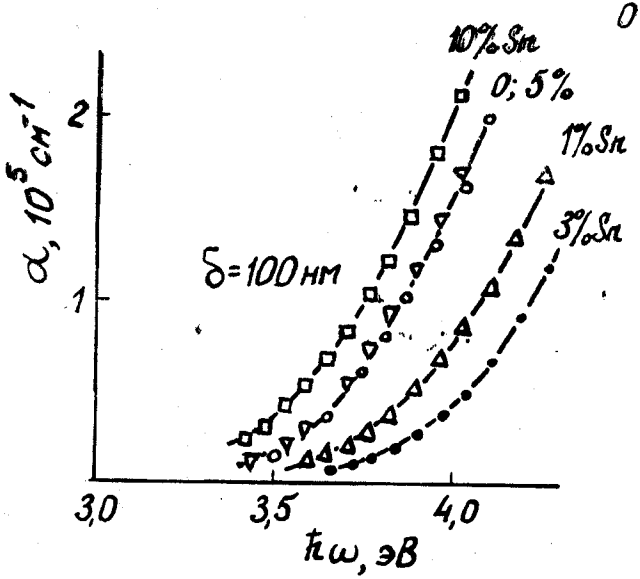
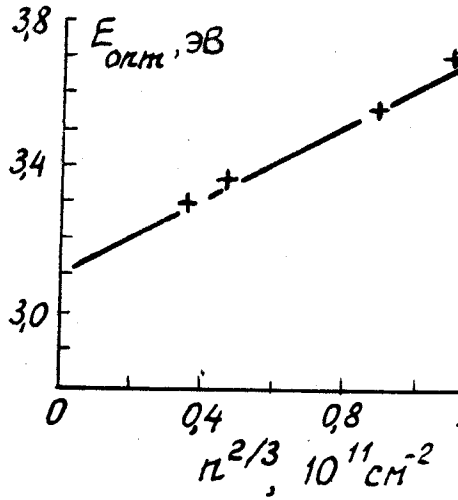


Figure 14. Emission spectra of a p-$SrCu_2O_2$/n-ZnO LED, obtained at room temperature by current injection. The emission intensity increased with the increasing current injected. The inset shows a plot of the emission intensity as a function of applied voltage. A turn-on voltage of about 3 V is seen.





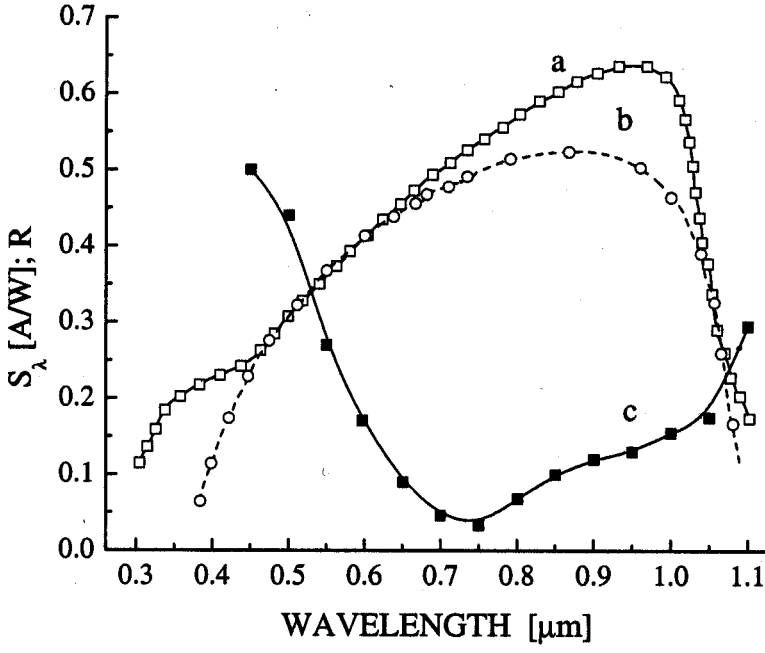




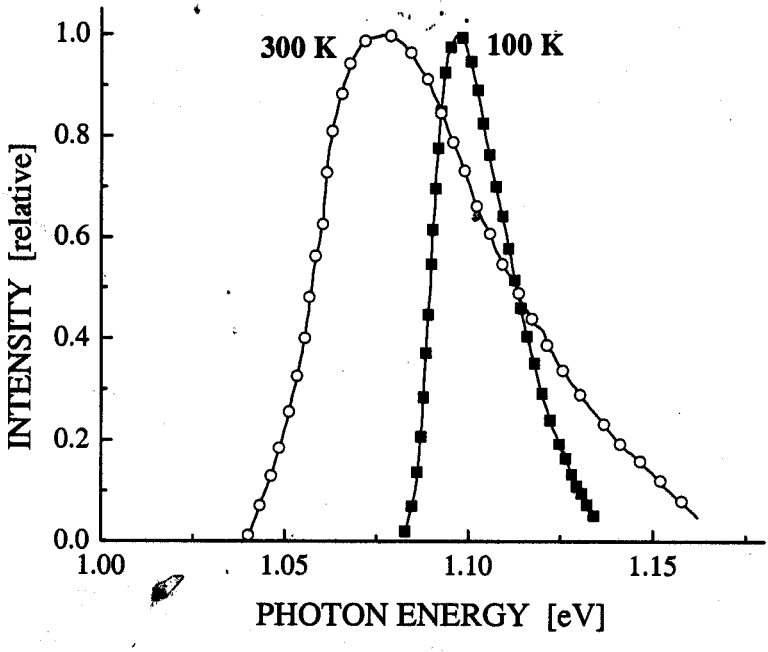
$$\Delta E_{опт} = E_f = \frac{(3\pi^2)^{2/3} \cdot \hbar^2}{2 m_d} \cdot n^{2/3}$$

ITO/SiO_x/n-Si light emitting diode

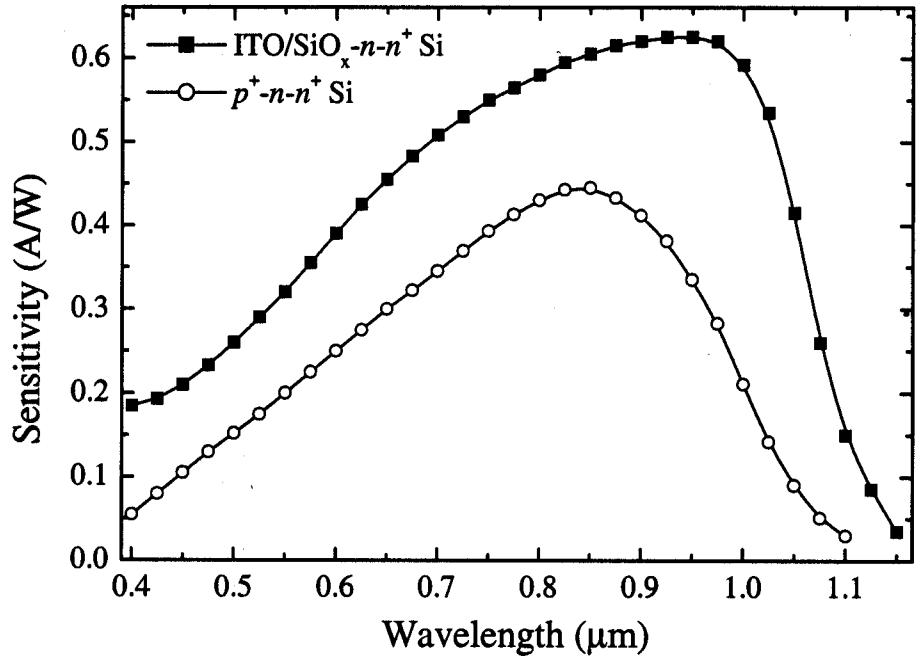
Responsivity



Emission



ITO/SiO_x/n-Si



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