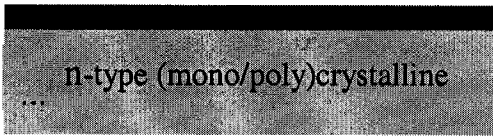
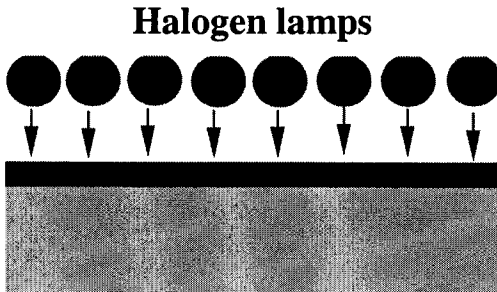


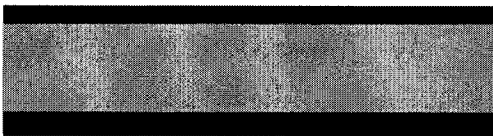
SIS solar cells : FABRICATION STEPS



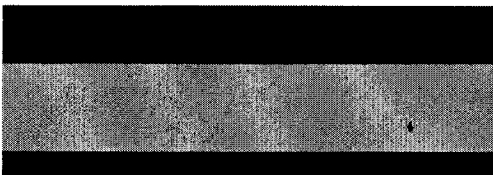
Deposition of the phosphorous containing organic film on the back side of the Si-wafer by spin-on technique



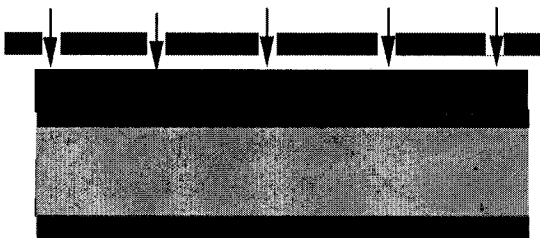
Making n^+ - back side contact by rapid thermal annealing



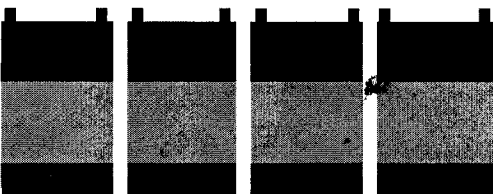
Fabrication of the tunnel oxide by chemical oxidation



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

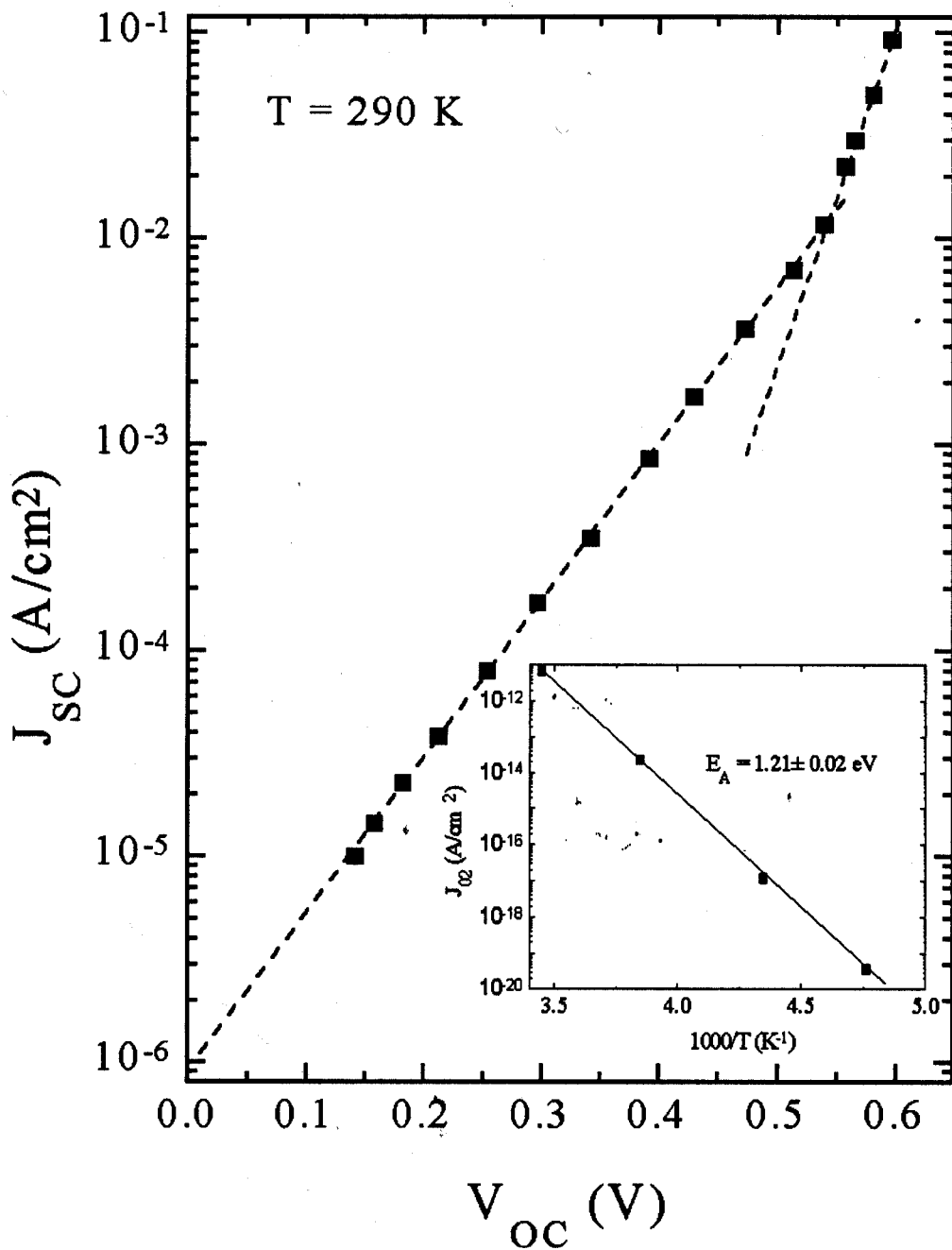


Vacuum deposition of the metallic grid



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	$\text{SrCu}_2\text{O}_2^*$
Substrate	$\alpha\text{-Al}_2\text{O}_3$ (0001)	$\alpha\text{-Al}_2\text{O}_3$ (0001)	Silica glass
Base pressure (Pa)	1×10^{-7}	6×10^{-8}	1.0×10^{-8}
Pressure (O_2 flow) (Pa)	1.3	9	7.0×10^{-4}
KrF laser frequency (Hz)	20	20	2
Laser power ($\text{J pulse}^{-1} \text{cm}^{-2}$)	5	6	2.5
Substrate temperature ($^\circ\text{C}$)	690	700	300
Substrate-target distance (mm)	25	25	40
Post annealing (temperature \times time) ($^\circ\text{C} \times \text{h}$)	690×3	None	300×3
Film thickness (nm)	500	500	120

*3% of Sr was replaced with K.

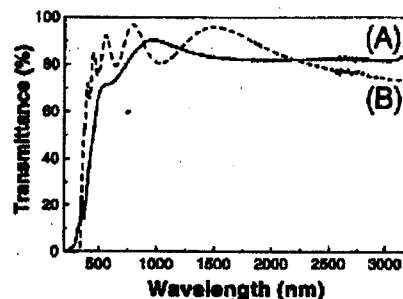


Figure 5. Optical-transmission spectra of (A) CuAlO_2 and (B) CuGaO_2 delafossite thin films in the UV-visible-near-infrared region.

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	$\text{SrCu}_2\text{O}_2^*$	AgInO_2^\dagger
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 ($\text{cm}^2 \text{V}^{-1} \text{s}^{-1}$)	10.4	0.23	0.46	0.47
Hall coefficients ($\text{cm}^3 \text{C}^{-1}$)	+48.6	+3.7	+12	-0.23
Seebeck coefficients ($\mu\text{V K}^{-1}$)	+183	+560	+260	-50

*3% of Sr was replaced with K.

†5% of In was replaced with Sn.

P-Type TCO

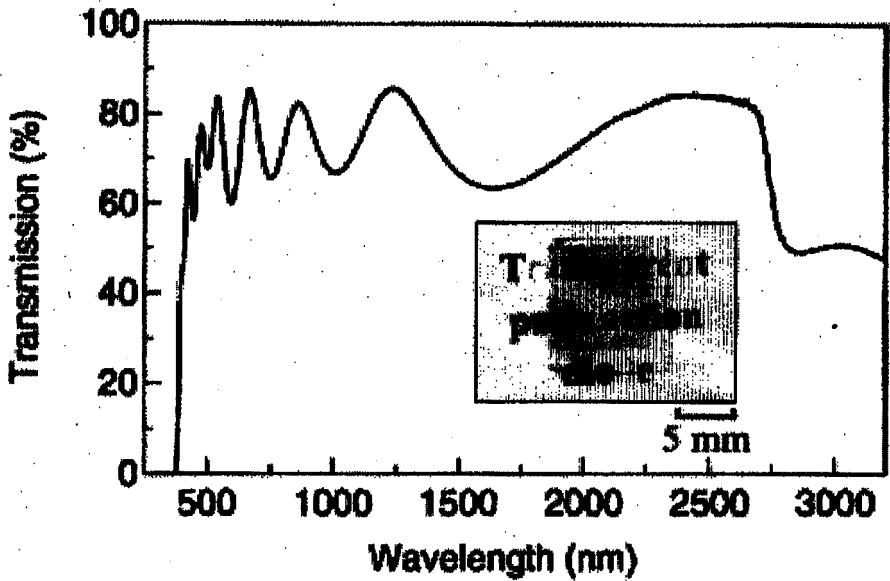


Figure 12. The optical-transmission spectrum and (inset) a photograph of a junction fabricated from $p\text{-SrCu}_2\text{O}_2$ and $n\text{-ZnO}$ on a glass substrate.

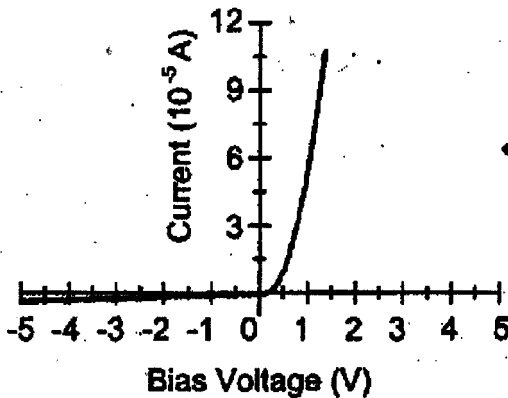


Figure 13. A typical I-V characteristic of transparent p-n heterojunctions. The junction exhibited nonlinear and rectifying I-V characteristics. The average turn-on voltage was around 0.3 V.

p-Type TCO

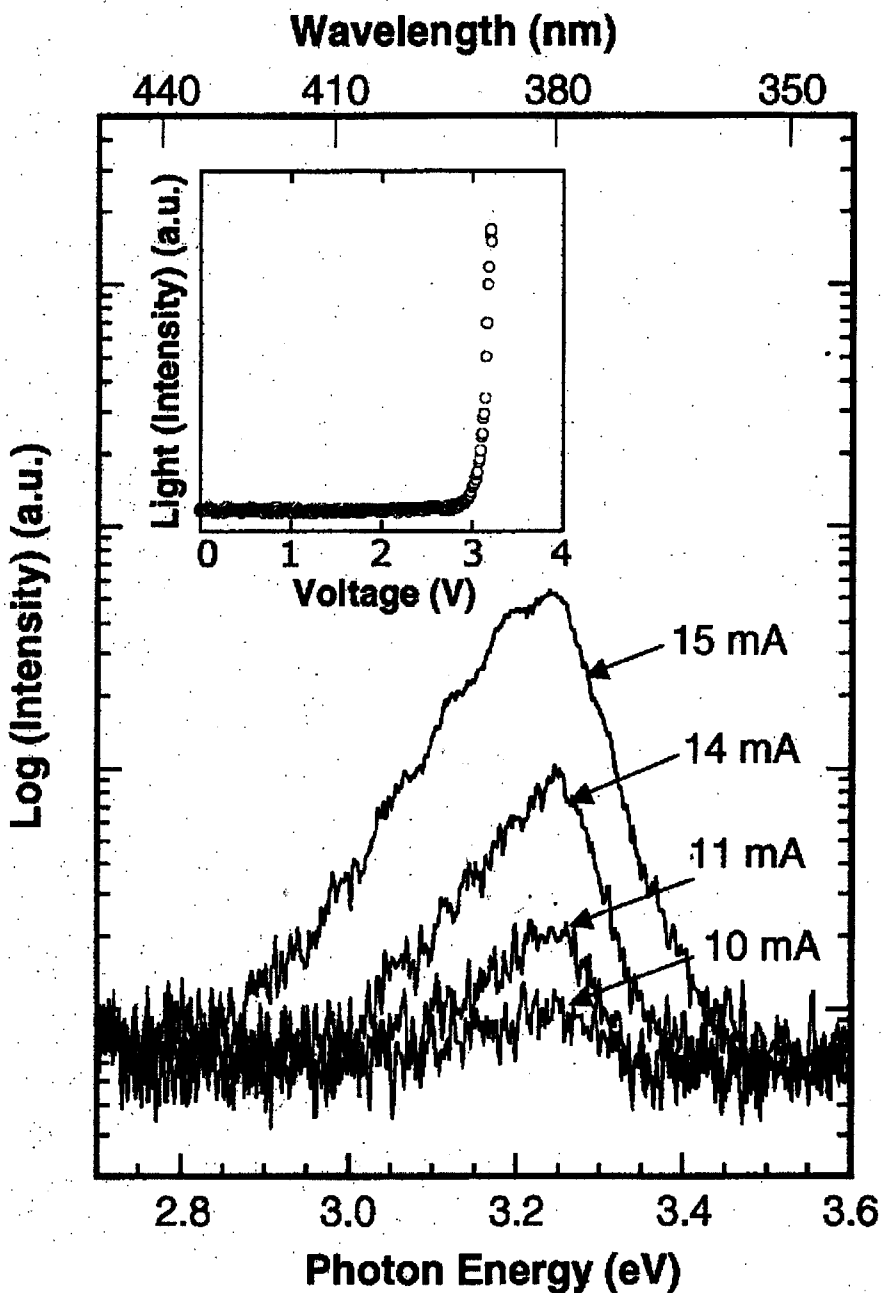
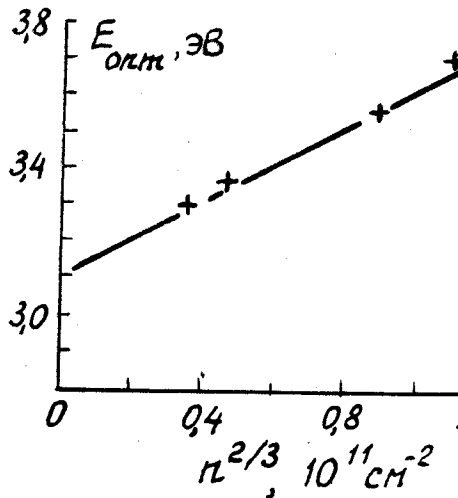
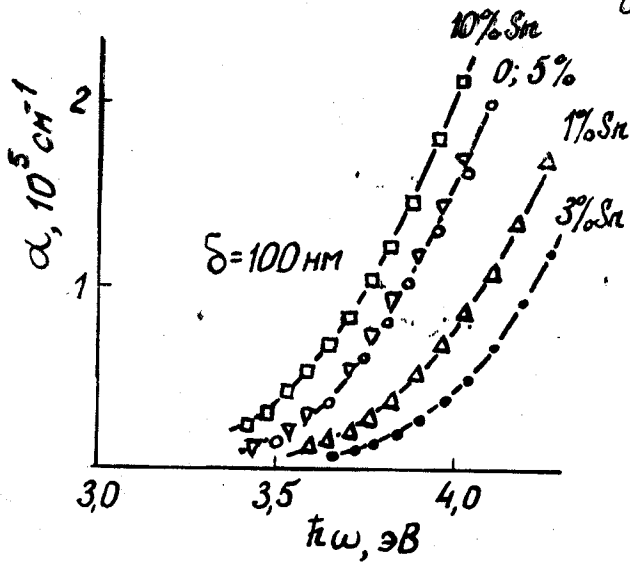
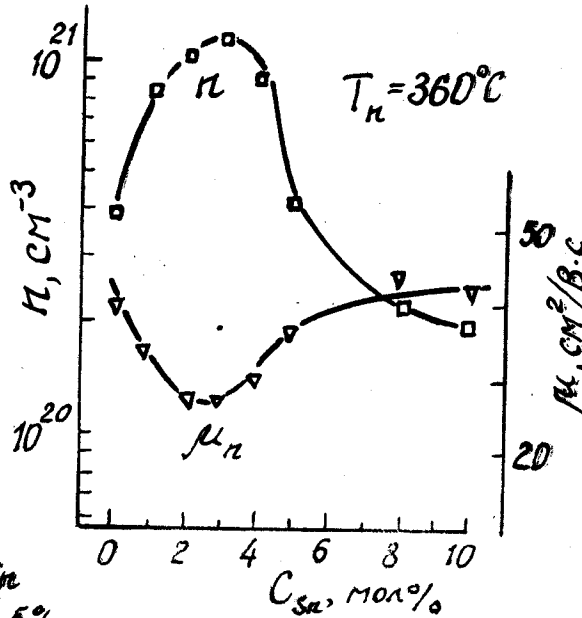
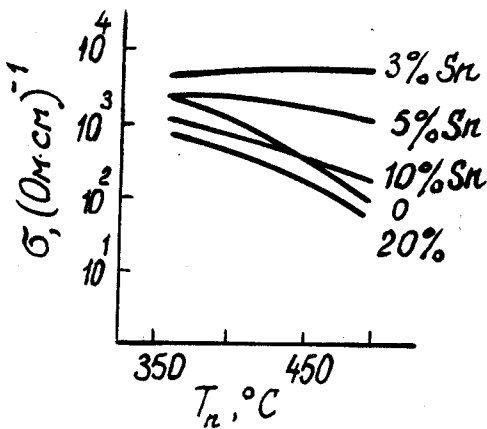


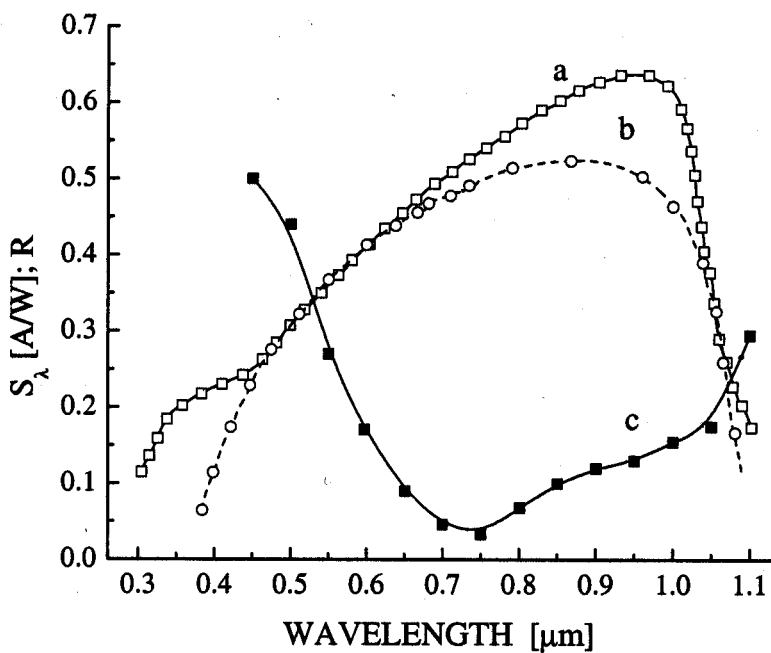
Figure 14. Emission spectra of a p-SrCu₂O₂/n-ZnO LED, obtained at room temperature by current injection. The emission intensity increased with the increasing current injected. The inset shows a plot of the emission intensity as a function of applied voltage. A turn-on voltage of about 3 V is seen.



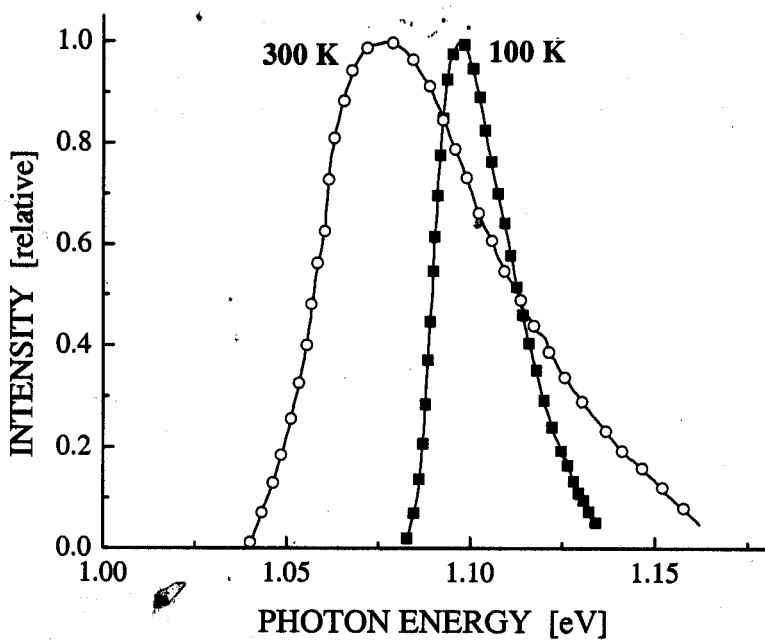
$$\Delta E_{0nm} = E_f = \frac{(3\pi^2)^{2/3} \cdot \hbar^2}{2m_d} \cdot n^{2/3}$$

ITO/SiO_x/n-Si light emitting diode

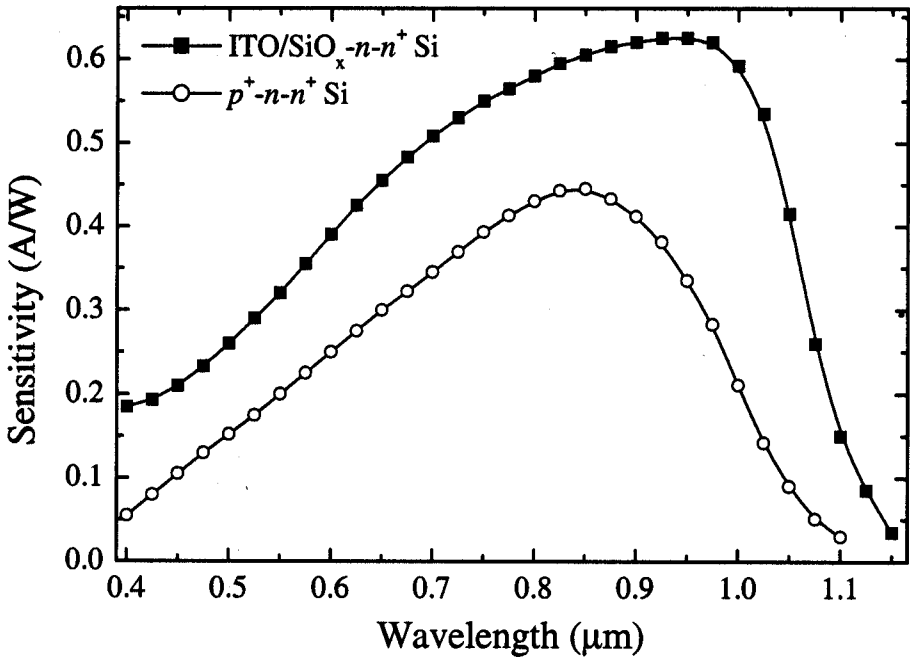
Responsivity



Emission



ITO/SiO_x/n-Si



file: us/m/lumin2 -plot3

