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# Study and Optimization Optical and Electrical properties of the p, i and n- Layers of Single Junction a:Si-H Solar cell in an Indigenously Developed PECVD Cluster System.

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**Abstract:** Hydrogenated amorphous silicon solar cells have been one of the principle drivers of large area and flexible microelectronics. Hence the effort is to develop single junction hydrogenated amorphous silicon solar cells, using an indigenously developed Plasma Enhanced Chemical Vapour Deposition system and also leverage plasmonics to further enhance the efficiencies. The software controlled PECVD system enables deposition and optimization of layers and solar cell device using a cluster 5 process chambers. In the present work, several experiments have been carried out by varying the critical process parameters in order to optimize the p and n-layers for obtaining efficient hydrogenated amorphous silicon (a-Si:H) p–i–n solar cell. The p-layer conductivity and band gap were found to have high influence on the efficiency of a-Si:H, p–i–n solar cell in addition to the i and n-layer properties. Single junction thin film a-Si solar cells have been fabricated with a maximum efficiency of around 5.89 %. The current band gaps of p-layer,i-layer and n-layers are 1.95 eV, 1.73 eV and 1.7 eV respectively. Presented in this paper are the details of the two above activities.
**Key words:** a:Si:H, PECVD, bandgap, conductivity.



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