Study on the Correlation between Deposition Parameters and Optoelectronic Properies in Intrinsic Hydrogenated Amorphous

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ABSTRACT

In this study,intrinsic hydrogenated amorphous silicon(a-Si:H) sample at different combination of deposition parameters, such as substrate temperature , RF powerdensity, flow rate and deposition pressure ,are fabricated to investigate the correlation between desposition parameters and theoptoelectronic characteristics in a-Si:H . The characterizationtechniques used in this systematic study includes activation energy ,photoconductivity,and sub-bandgap optical absorption measurements. In addition , the chemical growth mechanisms of a-Si:H film are also discussed in detail. The combination of deposition parameters that yields the best a- Si:H films for ourPECVD system is obtained as a by-product. This set of deposition parametrs is : RF power of 5W , substrate temperature of 275 C ,flow rate of 60sccm and deposition pressure of 550mTorr. The correspondinggrowth rate is 300A/min. With the set of deposition parameters, the obtain intrinsic a-Si:H films have an activation energy of 0.83eV; the photoconductivity canincrease by 5 orders ofmagnitude at AM1; the characteristic energy of valence band tailis 0.069eV.The Schottky doides fabricated with different contacts to the a-Si: H films also exhibit rectifying I-V characteristics with an ideality factor of 1.1 .

Keywords : intrinsic hydrogenated amorphous silicon

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